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EDMUND RUFFIN, EDITOR AND PROPRIETOR.

ON THE CULTURE OF WHEAT.

By TH. J. RANDOLPH.

Read before the Agricultural Society of Albemarle, and ordered to be published in the Farmers' Register.

In obedience to a resolution of this Society, appointing essayists at their October meeting, in 1835, I have the honor to submit the following communication upon the culture of wheat.

Although deep culture is important, if not indispensable with all plants, to permit their roots to penetrate the soil freely in search of food and moisture, and to allow the water in heavy rains to subside without abrading and gulleying undulating lands, or drowning those that are level, it may be doubted whether it be proper to effect this by frequent ploughing, and intermixing too perfectly the surface with the inferior soil or clay. Nature, in all her operations, manures on the surface, and forms there the soil which is best adapted to the growth of vegetation; and if this is inverted by the plough, she reinstates it in its original position as soon as the land is permitted to remain undisturbed a sufficient length of time, by a process more rapid in warm weather, and on rich soil, where there is much vegetable matter; and slower where the land is less fertile, and the weather colder. This is strikingly exemplified by a fact well known to most farmers, viz: that when good land (particularly clover land) with a distinctly marked surface of dark soil is fallowed for wheat, sown with the harrow upon one ploughing, and permitted to lie a year or two in clover, after the crop of wheat, the dark soil is found again formed upon the surface, occupying the position in which the clay was left by the previous ploughing and the clay, that which was occupied by the inverted soil: a change of clay into soil, and soil into clay. A question naturally arises. what good results from forcing the land to this double process? I should think, none. Economy of labor, however, requires this to be done, as an expeditious mode of disposing of the vegetable matter, by burying it with the plough; but with one ploughing, the necessity ceases for that crop.

I have said that this process was more rapid on rich soils where there was much vegetable matter, and in warm weather, than on poorer soils and in cold weather. I suppose it accomplished by the gases evolved in the decomposition of the vegetable matter turned under by the plough. If the weather is warm, and the vegetation green, succulent and abundant, the decomposition is rapid, and the quantity of gas disengaged is great. Of these, the carbonic is deemed the great stimulant of vegetable life; and being heavier than atmospheric air, but lighter than the soil, it rises to the surface, insinuating itself into the interstices of the clay brought up by the plough, saturates it, and accomplishes the first process of its conversion into soil. Hence, the cause of a well known fact, that fallows made in June, July, and early in August, become many shades darker on the surface, although exposed to the scorching rays of a summer's sun, and prior to a renewed growth of vegetation upon them. Whilst it less frequently occurs on those made in September, and on those in October rarely, until the next year, vegetation being drier, less succulent, the days shorter, the nights longer and cooler, and every circumstance less favorable to a rapid decomposition in these months. A similar process has taken place on the corn land after the cultivation of the corn has ceased, and before seed time. The fertile appearance of these lands at that time is familiar to every one.[a] This recently formed and forming soil, my experience has convinced me, is the proper surface for wheat. A second ploughing, or fallow, intermixes it with the inferior soil, and the use of the large plough on corn land produces the same effect. I formerly believed two ploughings necessary as a perfect preparation for a wheat crop. When pressed for time, I used heavy harrows as a substitute for a second ploughing, often where there was a strong growth of summer grass: such portions have always produced more grain, though perhaps less straw, than that which had been twice ploughed. I once fallowed twenty or thirty acres of land in February, ploughed it with a two horse plough whenever the grass and weeds grew in the summer—it was ploughed, in all, five times before seeding on the first of October, and although it suffered from no disaster, it produced a wretched crop for the year and the land. I have occasionally coultered and harrowed small pieces of land, and prepared them without turning the surface with the plough; and have, uniformly, found the straw brighter, and the wheat more in perfection, than on the adjacent land which had been ploughed, and the surface inverted, although both were very fine. In 1822, on four plantations then under my direction, the corn crop being very forward, about half of it was removed in September, and the land ploughed with three-horse ploughs. The preparation appeared to be perfect, the earth light and thoroughly pulverized, and the grass entirely rotted: the land was harrowed and then sown, and the seed harrowed in. In the mean time, the grass had continued to grow on the portions of the field not ploughed. When the seeding of the first was completed, the rest was sown among a heavy crop of grass, with scoops, merely scarifying the surface, for nothing more could be done: the whole process was tedious and unpromising, yet the perfect preparation by which the soil had been inverted by the large plough, produced a much inferior crop to the other: the result was the same at each plantation. In putting in wheat on corn land with small ploughs, I have often laid them aside for the large plough on account of the heavy coats of grass on rich spots, old tobacco lots, &c., resuming the small plough again on passing them. The product and appearance of those spots of better land thus prepared were always inferior to that of inferior land ploughed with the small plough. I could add many instances of a similar kind with similar results.

From my observations and experience, I deduce the following conclusion.

1. That to insure the best crop, lands should be fallowed early, viz: before the middle of August.

2. That the surface acted upon by this process of a re-formation of soil, is the proper one into which the grain should be put.

3. That a second ploughing with a large plough in fallows, and its use in preparing corn land for wheat, is disadvantagous. Nature, in both instances, has prepared a better surface than can be prepared by art.

4. That the mixing the newly formed soil, fully saturated with carbonic gas, with the inferior soil, prevents as quick and vigorous growth of wheat, and as early and as perfect maturity.

If the fallows have been ploughed early, and a crop of summer grass has grown upon them, they may be stirred with the small plough or coulter, if hard, or harrowed, if mellow, so as to pulverize and smooth the surface, without regarding the grass and the wheat sown among it. The first frost kills the grass, and it acts as a beneficial covering to the wheat.[*b*] When the fallows are prepared, and the corn crop sufficiently forward to take off in September, the corn land may be ploughed with the small plough, and harrowed ready for seeding, and thus enable the farmer to put all his teams to the harrow, and sow a large crop in a few days. Selecting his own time for seeding, he may hope to escape the dangers of early and late fly, and do much to insure a fair crop from his land. In anticipation of this, it is desirable to plant a corn which will mature itself somewhat earlier than the kinds now cultivated. We have a corn in this neighborhood well adapted to this purpose, which yields well. If the corn is too late to commence removing in time to prepare your land in September, the balks can be broken before the corn is taken off. You will then, upon removing the corn in the latter end of the month, have only to plough the list and harrow the land, to be ready for seeding. If a proper seed bed is prepared, one harrowing is sufficient to cover the grain.[*c*] In the October of 1833, I had sown in this manner 300 acres in four days and a half, employing eight harrows with two horses each, and two with a yoke of oxen each; in all, ten harrows. The teams were never hurried until the last day for a few hours, when there was an appearance of rain. The same hands and teams were closely employed the next four days in putting in forty acres of rough corn land. This present month (October, 1835,) six days have been taken, to put in three hundred and forty acres of land, eighty of which were rough with stone and stumps. The team employed the same.

When tobacco is cultivated as a mixed crop, the early corn ought to be planted. It does not attain such size of stalk, and can be removed with less labor, severing it at the ground, and stacking it on the field without pulling the fodder or cutting the tops. Enough hay should be made to serve the farm, and the time given to tobacco and other operations which is usually spent unprofitably about the fodder. I am satisfied that corn is less injured to be cut up, with the fodder and top on, than to take them off and leave it standing in the field. In the first place it cures; in the latter, it withers. I have heard a judicious farmer estimate, as fair work, 200 lbs. per day, the average of hands employed in gathering and securing fodder; of hay, 1000 lbs. The use of the revolving horse-rake on smooth land would much increase the latter average. I am aware, that in recommending the stacking of corn on the field, I am running counter to the opinions of some of our best farmers. I would not recommend it where the corn could be housed; but when it cannot be done, from attention to the tobacco crop, lateness of ripening, or deficiency of labor, I deem it better to lose the ground covered by the stalks, than the greater loss from late seeding. The injury of running your teams and carts over the fields in dry weather after the wheat is sown and up, in removing the corn, I estimate very lightly.

Note [*a*]. That this process must be effected by the action of the gases, is proven from the uniform fertility of grave yards. Here the bodies do not come in contact with the surface. It must be by the generated gas forcing its way through the fresh dry earth. Would a culture of several feet make poor land rich? I think not. Manures never sink. Upon light, sandy soils, with too small a portion of clay to imbibe and retain the gases, they penetrate easily, and escape rapidly; such require frequent applications of manure, but in smaller quantities—it acts promptly, but evaporates with the culture of a crop. Stiff clays, deficient in aperient particles, are not sufficiently permeable to the gas; the particles become compacted together by rain so as to expel it before it can be sufficiently imbibed. They close so completely over manures as to exclude the air, and arrest their decomposition. Upon such soils, manure ploughed under may be found, two or three years after, retaining its original appearance, but its fertilizing principle gone; for such, straw, half rotted manures that act as a temporary aperient, are best. Sand, or some substitute for it, is necessary for its mechanical effects as an aperient to every good soil. Its excess makes a quick soil soon exhausted; its deficiency, a stiff, slow soil. In addition, there are, no doubt, chemical combinations in all soils, rendering some capable of fertility, others not. The sterility of any soil may be temporarily overcome by the application of animal or vegetable manures. But, *quære:* Will not an originally poor soil, if made ever so rich by manures, left to itself without cultivation, lapse into its original sterility? and will not one, originally fertile, when exhausted, become rich if left undisturbed long enough?

[*b*]. Blue grass fallows will probably require a second ploughing to destroy it. The first ploughing on this grass should always be made before the grass seeds, as the plants are easily destroyed if disturbed about the time of their seeding. If fallowing is postponed until July or August, the crop becomes very precarious. It will most frequently happen, that after much time and labor has been spent, it will be injured or destroyed by the turf. If such lands cannot be ploughed in May, or early in June, this grass may be destroyed, or crippled, by hard grazing from spring until June or July—it being a grass without aftermath, or ground leaf, each spire is a seed-bearing spire, and the grazing necessarily confined to these; and if it is not permitted to seed, it perishes. It is a grass never found upon commons, or on road sides, where it is

perpetually grazed. It will probably be found, that grasses bear grazing in proportion to the quantity of ground leaf they put forth.

[c]. Some persons object to the harrow, as not covering the grain deep enough. If a grain of wheat is buried over 2 or 3 inches deep, it forms a joint near the surface from whence (if the plant is sown early, and the fall growth vigorous) it puts forth roots, and the spire and roots below that joint perish that fall, and the plant thrives by these surface roots.

From the Repository of Patent Inventions.

OBTAINING CREAM FROM MILK.

A process of divesting milk of its component portion of cream, to an extent hitherto unattainable, has been effected by Mr. George Carter, of Nottingham Lodge, and is thus detailed by that gentleman, in a paper presented to the Society of Arts: A peculiar process of extracting cream from milk, by which a peculiar richness is produced in the cream, has long been known and practised in Devonshire; this prodnce of the dairies of that country being well known to every one by the name of 'clotted," or "clouted cream." As there is no peculiarity in the milk from which this fluid is extracted, it has been frequently a matter of surprise, that the process has not been adopted in other parts of the kingdom. A four sided vessel is formed of zinc plates, twelve inches long, eight inches wide, and six inches deep, with a false bottom, at one half the depth. The only communication with the lower compartment is by the lip, through which it may be filled or emptied. Having first placed at the bottom of the upper compartment, a plate of perforated zinc, the area of which is equal to that of the false bottom, a gallon (or any given quantity) of milk is poured immediately when drawn from the cow, into it, and must remain there, at rest, for twelve hours; an equal quantity of boiling water must then be poured into the lower compartment, through the lip; it is then permitted to stand twelve hours more, [i. e. twenty-four hours altogether,] when the cream will be found perfect, and of such consistence that the whole may be lifted off by the finger and thumb. It is, however, more effectually removed, by gently raising the plate of perforated zinc from the bottom, by the ringed handles, by which means, the whole of the cream is lifted off in a sheet, without remixing any of it with the milk below. With this apparatus, I have instituted a series of experiments; and as a mean of twelve successive ones, I obtained the following results: four gallons of milk treated as above, produced in twenty-four hours, four and a half pints of clotted cream, which, after churning only fifteen minutes, gave forty ounces of butter—four gallons of milk treated in the common mode, in earthenware pans, and standing forty-eight hours, produced four pints of cream, which, after churning ninety minutes, gave thirty-six ounces of butter. The increase in the quantity of cream, therefore, is twelve and a half per cent. The experimental farmer will instantly perceive the advantages accruing from its adoption, and probably his attention to the subject may produce greater results. I shall feel richly rewarded if, by exciting an interest on the subject, I can produce any, even the slightest improvement in the quantity or mode of producing an article, which may properly be deemed one of the necessaries of life.

From the British Farmer's Magazine.

HISTORY OF THE NUTMEG.

The tree called *myristicha moschata* by botanists, grows naturally in a group of islands forming a part of the Moluccas, called the Isles of Banda, in the Indian Archipelago: a cluster which seems to have been thrown up by the sea in some volcanic effort, as there is now upon one of them, named Gonong Api, a volcano, constantly emitting smoke, and often flames. The first island, Banda Niera, is the chief settlement, and contains two forts: its harbor is spacious, but difficult of access. The second is Banda Lantoir: the third and fourth in importance are Puloway and Pulovun. These four islands were the only places where the cultivation of the nutmeg was allowed by the Dutch, but there are several others under the same government. What these islands produce in superfluities, they want in necessaries. The soil is a rich black mould, but it produces no corn, the natives subsisting chiefly upon sago. The nutmeg tree grows like a pear tree in form and size; its leaf resembles that of the laurel, being of a bright green color on the upper surface, and grayish underneath: when bruised, it diffuses an aromatic perfume. The flowers are white, small and scentless. The fruit is similar to a walnut in form, but more fleshy and full of juice. The external pulp dries up to a crust of a deep yellow color, which, opening at one side, discloses a membraneous coat of a beautiful red tint, known to us by the name of mace, which lies immediately over the thin and brittle shell of the nutmeg. This is the time te gather the fruit; if left longer on the tree, the mace would get loose, and the nutmeg would lose that oil, which preserves it, and which is one of the great excellences of the fruit. The nutmegs, which are gathered before they are perfectly ripe, are preserved in vinegar or sugar. The tree yields three crops annually, the first in April, which is the best, the second in August, and the third in December, yet the fruit requires nine months to ripen it: thus the tree is constantly bearing flowers and fruit at the same time. After the fruit is gathered, the outer covering is stripped off, and the mace being carefully separated from the kernel, is laid in the sun to dry. The nuts require more prepararion; they are spread upon hurdles, and dried for six weeks, before a slow fire, in sheds erected for the purpose. After this they are separated from the shell and thrown into a strong mixture of lime and water, which is a necessary precaution to preserve them from worms: with the same intention the mace is sprinkled with salt water. After this process, the fruit is cleaned, and packed up for exportation.

It appears, from experience, that only one-third of the nutmeg trees bear fruit, but this cannot be discovered until the twelfth or fourteenth year of their growth; therefore, they must not be cut down at an earlier age. The fruit-bearing property is of short duration, as the tree will yield only from the twelfth to the twentieth year, and generally perishes at the age of twenty-four

years. The nutmeg tree delights in a damp soil, overgrown with weeds, and even shaded with large trees, provided it be not stifled with them. Under the shelter of the *canmarium commune* (?) it thrives very well, and bears the cold of the tops of the mountains. The fruit differ in quality according to the age of the tree, the soil, and the method of culture. The round nutmeg is preferred to that which is oblong, though they are specifically the same. It ought to be fresh, moist, heavy, of a good scent, and an agreeable, though bitter flavor, and it should yield an oily juice when pricked. The islands are divided into a number of plantations, under the management of a mixed race of Europeans and Indians. The Dutch made use of many illiberal means to secure to themselves the exclusive possession of these valuable productions; many trees they destroyed, reserving only sufficient to produce a certain quantity of nutmegs; but finding the climate of Banda very unhealthy, and that a great number of their servants fell victims to it, they attempted to transfer the culture of this spice to Amboyna; these experiments have, however, proved unsuccessful.

In 1774, the English navigator, Forrest, found in a small island near New Guinea, called Manaswary, a nutmeg tree, the fruit of which was of an oblong shape, but well flavored. This enterprising man plucked up about a hundred stems of the tree, and planted them in 1776, on the island of Bunwoot, which had just been ceded to him for the East India Company, by the Sultan of Mindanao. Bunwoot is situated to the north east of Borneo, and is a healthy spot, covered with beautiful trees.

Libilliadiere also found the nutmeg tree upon the little island of Cocos, near the northern extremity of New Ireland. The fruit, when he saw it, was unripe, and of an oblong form. The island is covered with evergreen trees, among which the *Barringtonia speciosa* is conspicuous. It extends its branches laden with flowers horizontally a great way over the sea.* There are few cocoa-nut trees, but many figs of different kinds. Fruits of several species of the screw pine, of the *Barringtonia*, and of the *Heritiera*, which trees stretched their branches and even their trunks, in a very remarkable manner over the sea. It is thus, no doubt, that the seeds of plants are conveyed from one island to another without the assistance of man. Where there are no rills to carry fruits to the sea, the want of moisture prompts these trees to bend over the ocean, and obtain from its evaporation the nourishment they require.

The principal of the Molucca islands are Amboyna, noted for the cultivation of the clove-tree; to which may be added Ceram, Ternate, Tidore, and Batchean. Ceram is a large island to the north of Amboyna. Several chains of mountains run parallel to each other in a direction from east to west, and separated by fertile vallies containing luxuriant vegetation. In ancient times the peninsula of Hoewamochel produced large quantities of nutmegs, but the trees were extirpated by the Dutch about the year 1697. At present it is covered with sago trees *(cycas circinales.)* The wood usually called Amboyna, and the Salmoni, both of which are exported from Amboyna for the purposes of ornamental cabinet work, are mostly the productions of Ceram. Along the shores of this island, uncommonly fine shells are found.

Ternati is only about twenty-four miles in circumference. Larger nutmegs are found in its woods than any procured at Banda: but the culture of them is discontinued.

Tidore, the next of these islands, lies to the south of Ternate, and, like that island, is mountainous, and well watered by streams from peaks which are generally capped with clouds. In 1521, Juan Carvallo, one of the surviving companions of Magellan, arrived at Tidore, where he was well received, and allowed to load two ships with spices for Spain. The Portuguese and Spaniards after this traded to the island. In 1579, Drake arrived there and began to gather spices without having permission from the king, who was at first greatly incensed, but was afterwards appeased by presents. The inhabitants of all these islands are Malays.

The Chinese landing upon the Moluccas were the first discoverers of the clove and nutmeg, These new acquisitions were soon admired all over India, whence they were conveyed to Persia and Europe. The Arabians repaired to the islands but were driven out by the Portuguese, who, in their turn, yielded to the Dutch in the year 1621. After being alternately in the possession of their conquerors and the English, they were finally taken possession of by the latter in 1810. I have named those of the Moluccas only which are noted for their spices. Among the numerous small islands comprehended under the same government, are several producing various articles of exportation.

When we reflect upon such productions of nature as those of which I am treating, we must admire the beneficence of the Almighty, in having provided us with the means of varying, according to our particular taste, the flavor of the food necessary to our sustenance: how much more grateful ought we to be for those higher blessings of intelligence and industry, without which the treasures of the east would have remained confined to the distant spots where they grow. We import from these and other lands, luxuries, which by constant use almost become necessaries to us: we ought at least to bestow in return, the blessings and virtues of civilization. Many Europeans have and are attempting this, but it is to be feared that, until by some great revolution in the moral world, the degrading traffic in slaves be entirely abolished, civilization will make but slow progress in the three quarters of the world thus disgraced. We are assured that the "knowledge of the Lord shall cover the earth as the waters cover the sea," and although we shall not see that period, we must trust that it will arrive; and that then the gentle Hindoo and the savage Malay, shall be united in the bonds of Christian peace and brotherly love.—*Magazine of Domestic Economy.*

*This circumstance is remarked by every voyager passing through among these islands

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From the Arcana of Science and Art, for 1836.

EFFECT OF GASES ON VEGETATION.

M. Macaire introduced some plants of Euphorbia, Mercurialis, Senecio, Sonchus, &c. into vessels along with chloride of lime in the morning. When evening arrived the plants had not suffered,

and the odor of the chlorine was as strong as at first. Next morning they were found withered, the smell of chlorine had disappeared, and was replaced by a very disagreeable acid odor. The same result was obtained on repeating the experiment several times.

Nitric acid withered the plants during the night, but in the day time merely rendered some of them brown colored.

Sulphuretted hydrogen produced no alteration when light was present, but destroyed them in the night, by the absorption of the gas.

Muriatic acid gas acted in a similar manner.

From the New England Farmer.

TO KEEP BUGS FROM VINES

A correspondent of the Maine Farmer says, I last year planted my cucumbers, &c. near where grew some tansy at one corner—soon after up, the "striped jackets" attacked them, except those in the immediate vicinity of the tansy. Observing this, I put around each hill some sprigs of tansy, which caused the bugs to leave them, and by a few applications, so as to keep it somewhat green, were kept off, as the scent is strong and I believe not agreeable to them.

C. D.

East Winthrop, May, 1836.

It is said that branches of elder laid on each hill will keep bugs from vines.

DEFECTS IN THE EXISTING LAW AND PRACTICE IN REGARD TO THE ISSUING OF PATENTS.

Extract from the Report of the Committee to Congress.

[The following extract embraces all the material part of the recent report of the Committee of Congress "appointed to take into consideration the state and condition of the Patent Office, and the laws relating to the issuing of Patents for new and useful inventions and discoveries." The draft of a bill accompanies the report, which is designed to remove the numerous existing defects of the system. This extract will be enough to show that the present system, instead of serving its intended purpose of rewarding inventive talent, and of sending abroad for general use, real and valuable inventions, serves rather to reward impostors and violators of patent rights, and to defraud both inventors and the public, by aiding and encouraging falsehood and delusion.—Ed. Far. Reg.]

The first act of Congress on the subject was passed in 1790. It authorized the Secretary of State, Secretary of War and the Attorney General, or any two of them, on application, to grant patents for such new inventions and discoveries as they should deem "*sufficiently useful and important.*" Under that act the board so constituted exercized the power of refusing patents for want of novelty in the invention or of sufficient utility and importance.—This act extended the same privilege to aliens as to citizens. In 1793, it was repealed, and another act passed, authorizing patents to citizens of the United States only to be granted by the Secretary of State, subject to the revision of the Attorney General. In 1800, the privilege to take out patents was extended to aliens who have resided two years in this country, and made oath of their intention of becoming citizens of the United States.

The act of 1793, which is still in force, gives, according to the practical construction it has received, no power to the Secretary to refuse a patent for want of either novelty or usefulness. The only inquiry is whether the terms and forms prescribed are complied with. The granting of patents, therefore, is but a ministerial duty. Every one who makes application is entitled to receive a patent by paying the duty required, and making his application and specification in conformity with the law. The necessary consequence is, that patents have, under the act of 1793, been daily granted, without regard to the question of novelty, or even utility in the ordinary sense; for it has been settled that the term useful, as used in this statute, is only in contradistinction to hurtful, injurious, or pernicious. This construction (that no right is conferred to refuse a patent) has been given to the law by the Department charged with the duty of granting patents, not so much probably from any necessary and unavoidable import of the terms of it, as from a disinclination to exercise a power of so much importance, in cases where it is not clearly and distinctly granted. And it may be reasonably doubted whether it was the intention of Congress to confer such a power on the Secretary of State alone, since no provision is made for an appeal or other remedy for an incorrect decision adverse to the applicant. Besides, any person occupying that station might be supposed as little qualified by an acquaintance with the appropriate branches of science or of the arts, to decide such questions, as any other officer of the Government. And were he to undertake the task of such an examination as would be necessary to a decision in each case, he would have little time for other official duties.

Under the act referred to, the Department of State has been going on for more than forty years, issuing patents on every application, without any examination into the merit or novelty of the invention. And the evils which necessarily result from the law as it now exists, must continue to increase and multiply daily, till Congress shall put a stop to them. Some of them are as follows:

1. A considerable portion of all the patents granted are worthless and void, as conflicting with, and infringing upon one another, or upon public rights not subject to patent privileges; arising either from a want of due attention to the specifications of claim, or from the ignorance of the patentees of the state of the arts and manufactures, and of the inventions made in other countries, or even in our own.

2. The country becomes flooded with patent monopolies, embarrassing to bona fide patentees, whose rights are thus invaded on all sides; and not less embarrassing to the community generally, in the use of even the most common machinery and long-known improvements in the arts and common manufactures of the country.

3. Out of this interference and collision of patents and privileges, a great number of lawsuits arise, which are daily increasing in an alarming degree, onerous to the courts, ruinous to the parties; and injurious to society.

4. It opens the door to frauds, which have already become extensive and serious. It is represented to the committee that it is not uncommon for persons to copy patented machines in the model-room; and, having made some slight immaterial alterations, they apply in the next room for patents. There being no power given to refuse them, patents are issued of course. Thus prepared, they go forth on a retailing expedition, selling out their patent rights for States, counties, and townships, to those who have no means at hand of detecting the imposition, and who find, when it is too late, that they have purchased what the venders had no right to sell, and which they obtain thereby no right to use. This speculation in patent rights has become a regular business, and several hundred thousand dollars, it is estimated, are paid annually for void patents, many of which are thus fraudulently obtained.

In this collision and interference of patents, the original and meritorious inventor sees his invention, to the perfection of which he has devoted much time and expense, pirated from him, and he must forego the reward which the law was intended to secure to him in the exclusive right it grants; or he must become involved in numerous and expensive lawsuits in distant and various sections of the country, to protect and confirm his righis. If he be wise, he will generally avoid the latter, and submit to the former alternative of injustice, to which the Government, as the law now is, makes itself accessary. The practice is scarcely less reprehensible, of taking out patents for what has been long in pnblic use, and what every one has therefore a right to use. The patentee in such cases being armed with the apparent authority of the Government, having the sanction of its highest officers the seal of state, scours the country, and by threats of prosecution, compels those who are found using the thing patented, to pay the patent price or commutation tribute. This exaction, unjust and iniquitous as it is, is usually submitted to.

The extent of the evils resulting from the unrestrained and promiscuous grants of privileges, may be imagined, when it is considered that there are now issued, since this year commenced, at the rate of more than a thousand a year; a considerable portion of which are doubtless void for want of originality in the inventions patented, either in whole or in some of the parts claimed as new.

A necessary consequence is, that patents even for new and meritorious inventions are so much depreciated in general estimation, that they are of but little value to the patentees, and the object of the patent laws, that of promoting the arts by encouragement, is in a great measure defeated.

To prevent these evils in future is the first and most desirable object of a revision and alteration of the existing laws on this subject. The most obvious, if not the only means of affecting it, appears to be to establish a check upon the granting of patents, allowing them to issue only for such inventions as are in fact new and entitled, by the merit of originality and utility, to be protected by law. The difficulty encountered in effecting this, is in determining what that check shall be; in whom the power to judge of inventions before granting a patent can safely be reposed, and how its exercise can be regulated and guarded, to prevent injustice through mistake of judgment or otherwise, by which honest and meritorious inventors might suffer wrong.

It is obvious that the power must, in the first instance, be exercised by the department charged with this branch of the public service. But as it may not be thought proper to intrust its final exercise to the department, it is deemed advisable to provide for an occasional tribunal to which an appeal may be taken. And as a further security against any possible injustice, it is thought proper to give the applicant in certain cases, where there may be an adverse party to contest his right, an opportunity to have the decision revised in a court of law.

The duty of examination and investigation necessary to a first decision at the Patent Office is an important one, and will call for the exercise and application of much scientific acquirement and knowledge of the existing state of the arts in all their branches, not only in our own, but in other countries. Such qualifications in the officers charged with the duty, will be the more necessary and desirable, because the information upon which a rejection is made at the office, will be available in the final decision. It becomes necessary, then, to give the Patent Office a new organization, and to secure to it a character altogether above a mere clerkship. The competency and efficiency of its officers should correspond with their responsability, and with the nature and importance of the duties required of them. When the existing organization was adopted, the granting of patents was a matter of little importance, compared with what it now is. The arts in this country were but little understood, and but little cultivated. Agriculture and commerce constituted our principal business. We had few manufactures, except those of a domestic character, adapted to ordinary domestic wants. Our work-shops were in Europe. Enterprise, in this country, ran in other channels. The war of 1812 gave it a new direction, and a new impulse, by creating an occasion for work-shops of our own. Necessity became the mother of invention, and American manufactures sprang into existence as by enchantment. Their rise and progress may be dated from that period; and a more rapid advancement in the arts, and a more astonishing development of human ingenuity, have never taken place in any other age or country. This remark will appear far from extravagant to every one who will take the trouble to examine the subject. This awakening of dormant genius to a practical and active existence, next to the arousing of the political and patriotic energies of the Union, was one of the great results of that contest.—It opened to the country a new era. The nation entered upon a new existence. And since that period, American industry and enterprise, guided by American ingenuity and intellect, have achieved what would have taken Europe a century to accomplish. She has become all at once a manufacturing, as well as an agricultural and commercial nation. The useful arts have been cultivated with a success before unexampled, and have contributed, in no small degree, to the wonderful improvements which have spread themselves over our whole country. Who can predict the results, even in a few years, of that spirit of enterprise which pervades the Union, when, aided by the Genius of Invention, and propelled onward by powers which she alone can bring into exercise? The very el-

ements are submissive to her will, and all the end less combinations of mechanism are subservient to her purposes. She participates in almost every business and employment of man. Agriculture itself might as well dispense with fertility of soil, as with her aid in its cultivation.

The greatly increasing number of patents granted, affords some indication of the improvements which have been going on in the useful arts from year to year. The average number issued annually, from 1790 to 1800, was but 26; from 1800 to 1810, the average number was 91; from 1810 to 1820, it was 200; and, for the last ten years, the average number has been 535. During the last year, there were issued 776; and there have been granted in the first quarter of the present year 274, being more in three months than were issued in the whole of the first period of ten years. In the 22 years preceding the war of 1812, the average annual number was 73. The first quarter of the present year indicates an aggregate for the year, of 1,096; the amount of the duties on which, will be upwards of $32,000. The whole number issued at the Patent Office, under the laws of the United States, up to the 31st of March last, is 9,731. This is more than double the number which have been issued either in England or France, during the same period. In England for ten years preceding 1830, the average number of patents granted in one year was 145

Whoever imagines that, because so many inventions and so many improvements in machinery have been made, their remains little else to be discovered, has but a feeble conception of the infinitude and vastness of mechanical powers, or of the unlimited reach of science.—Much as has been discovered, infinitely more remains unrevealed. The ingenuity of man is exploring a region without limits, and delving in a mine whose treasures are exhaustless. "Neither are all the mysteries of nature unfolded, nor the mind tired in the pursuit of them."

The first conceptions of ingenuity, like the first suggestion of science are theories which require something of experiment and practical exemplification to perfect. Mechanical inventions are at first necessarily crude and incomplete.—Time is required to develope their imperfections and to make the improvements necessary to their adaption to practical uses. Inventors generally obtain patents before they venture upon those experiments which only can test their inventions. They are apprehensive of being forestalled in their discoveries, and see no other means of protecting themselves against piracy and fraud, than by securing patents at once.

A remedy for this may be easily had in a provision authorizing caveats to be filed in the office. giving security to the right of discovery for a time sufficient for making the necessary experiments, inquiries and improvements.

Heretofore aliens not resident in this country, have not been admitted to the privileges of our patent laws. But, as American citizens are allowed to take out patents in England and in other countries, a principle of reciprocity would seem to require that foreigners should have similar privileges here, on paying a similar duty or amount of fees that is exacted of our citizens abroad. The fees payable in England, on taking out a patent, amount to $585. If a patent be taken out for the three kingdoms of England Ireland, and Scotland, they amount to $1,680.—In France they are $309; in Spain $292; Austria, $208.

A power in the Commissioner of the Patent Office to reject applications for want of novelty in the invention, it is believed, will have a most beneficial and salutary effect in relieving meritorious inventors, and the community generally, from the serious evils growing out of the granting of patents for every thing indiscriminately, creating interfering claims, encouraging fraudulent speculators in patent rights, deluging the country with worthless monopolies, and laying the foundation for endless litigation.

In nineteen cases out of twenty, probably, the opinion of the Commissioner, accompanied by the information on which his decision is founded, will be acquiesced in. When unsatisfactory, the rights of the applicant will find ample protection in an appeal to a board of examiners, selected for their particular knowledge of the subject-matter of the invention in each case.

By this means, without danger to actual and honest inventors, the number of patents would be somewhat diminished. But there would be more confidence in those which should be granted, and as those which have been heretofore issued, should be daily expiring by their limitation, the community would begin to feel and realize the advantages of such a change. The present law waits till infringements and frauds are consummated—nay, it even aids them; and then it offers an inadequate remedy for the injury, by giving an action for damages. It ought, rather, by refusing to grant interfering patents, to render prosecutions unnecessary. Instead of sanctioning the wrong by granting the privilege to commit it, it should arrest injury and injustice at the threshold, and put an end to litigation before it begins.

Important and interesting as the Patent Office is now considered, it is believed that, under such new organization as is contemplated by the bill presented here-with, it will contribute largely to the great interests of the country, and bear no small part in elevating our national character. American ingenuity has obtained much consideration on the other side of the Atlantic. Even the manufactures of England are not a little indebted to it for some of their most valuable improvements. Her woolen manufactures, especially, have, within a few years, undergone an entire change, by the adoption of American inventions, by which wool has been made as yielding and submissive to the power of machinery as any material whatever. Cotton machinery has also been greatly improved in the hands of our mechanics; and while England receives from us three fourths of the cotton she uses in raw material, we furnish her also with some of the most valuable improvements in the means of manufacturing it. Indeed, what mechanism or manufacture has, for the last twenty years, been brought across the Atlantic, that has not, on being returned, borne the distinguished marks of the superior ingenuity of American mechanists? Formerly, we borrowed and copied much that was valuable from Europe. Now, Europe is borrowing and copying, with no little advantage, from us; and she must not be too much surprised if she shall soon find a formidable balance against her.

From the Easton Whig.

No. I.

ON THE EASTERN SHORE RAIL ROAD.

To the People of the Eastern Shore.

On the day the Legislature adjourned, I wrote a note to two editors of newspapers, indicating a desire to trouble their types a little, as soon as I returned home and could find leisure, on the subject of the proposed *Eastern Shore Rail Road;* but although the balance of that letter was published, I am not aware the only part which I desired should meet the public eye was ever published, and that was for an invitation speedily to take up the subject for their sage consideration. I am aware that those of our countrymen whose vision has been bounded by the sensible horizon which surrounds their own domicils, or whose indolent thoughts have not been permitted to wander beyond the circle of their every day employment, or every day enjoyment, regard this scheme as one which could only have found birth in the feverish brain of some moon-struck visionary. What, say they, "a Rail Road through the E. S. Peninsula! and to be a part too of the great national works to afford rapid travel between the North and South? preposterous! monstrous!"

In the outset I profess a want of sufficient time to do justice to this important subject in hasty essays, and above all, want of time will preclude me from obtaining authentic proofs of some facts, which, nevertheless, certainly exist, and which are essential to render the case I am supporting, perfectly clear and obvious to the most incredulous; but if such of our countrymen as are now sceptical on this subject will have patience to come along with me, I will promise at least to make him doubt in his disbelief of this scheme, if I do not convince him unconditionally of its practicability at a cheap rate, advantages to the whole Shore, and profit to the stockholders. It will not be my purpose to attempt to show that there is at this time travel and commerce enough on this shore to justify from its resources the making a rail road, although I will say, that the existence of a rail road for a term of fifty years would create in that time the necessary travel and commerce; but I propose to show that there is foreign travel from the south to the north, now in readiness to support this road by its means alone, and independent of the funds to be derived from the liberal and enlightened plant of the general government which proposes to make the rail roads the exclusive carriers of the mails. While the government will save money and have the mail carried with more certainty and despatch by their plan on rail roads, it will be seen that the amount received by the roads for this purpose will be nearly entirely clear gain to them.

On casting the eye over the map of our peninsula, it will be seen that we not only have the most favoured spot, that perhaps nature in her bounty ever created on the face of this globe, for the projection of a rail road; but besides this we have a beautiful spot of earth, bearing other characteristics. It has come from the hands of its creator, with almost the same smooth finish which it could have possessed, had it been under the graduation of a corps of engineers, employed from the days of Father Noah to the present time. Our soil is emphatically fertile, and not an inch of it but may, by the use of lime, be made first rate land, equal in its general productiveness to any land in the country. Our whole shore has been overspread and shaded by rich and heavy forests large portions of which particularly in the interior still remain to attest its native origin and fertility; we are nearly surrounded by two of the noblest bays in the world, and we are cut up and intersected by navigable rivers and creeks, to an extent unlike all other spots on the face of the Globe; affording navigation for transportation from almost every neighborhood; these natural highways, many of them do not go far into the interior, and whilst they give us transportation from place to place, give us a number of luxuries for our diet, which go to supersede one-half of the labor necessary for sustenance, and exceeds perhaps in its variety, abundance, and excellence, the supply afforded by any other place on earth. It is to those extraordinary and wonderfully advantages more than to any thing else, that may be ascribed, extraordinary as it may seem, the inertness, the indolence and supineness, which has caused our population to retograde in numbers as our lands have retrograded in quality—no axiom is more true than that which alleges that men work and improve their soil, just in the ratio of the difficulty of obtaining subsistence from it. When we gain subsistence with very little labour we soon become impatient of any labour—when men are compelled to work hard every day to gain there daily subsistence, labour becomes habitual, and habit makes it pleasant.

Our shore from these very causes, strange as at first view they may seem, has fallen into neglect, and many of our most enterprising citizens are annually leaving us. The spirit of public Internal Improvements, so rife in the country, has occupied the thoughts of all our people or emigration, believing that we were without those natural and incidental advantages, which could lead to similar improvements on this Shore, and that we must therefore remain forever stationary.

A brighter day is undoubtedly dawning on this Eastern Shore, and one that is to bind her citizens to her from one extreme of our bounds to the other, a day that is to bring, and speedily, a great increase to her population, and to make the Eastern Shore that which nature intended it should be, the garden spot of the country.

Whilst there is a vigorons effort now progressing along the line of our exterior water courses to improve the soil, the interior of the Shore is every day becoming thinner of its inhabitants, and every day brings an increasing number of old fields turned out to run into wilderness or waste land. How long I would ask, would it require for the improvements now going on upon the navigable water courses, chiefly by means of calcareous manures, to reach the interior of the Shore without the aid of a rail road through it, with laterals to every convenient navigable point on both the waters of the Delaware and the Chesapeake? Ages might be required, whilst by the operation of the rail road, fifty years would not be required to place it completely on a footing throughout, with the most favored and most improving portion of the United States.

It will be borne in mind that the rivers, and creeks of our shore take their rise near the centre of the peninsula, fall to the east into the Delaware, and into the Chesapeake in the west. If you

draw a line through the centre, it will be found to pass throughout our table lands, and cross cuts through more than two or three of those waters as low as navigable points. Our shore may be likened to a comb laid directly north and south, with a bar in the middle of the table land, resembling the teeth of the comb. By a straight line rail road, on this table land, as may be seen by the map, the distance will be only a fraction over one hundred miles, and on this rail road, by a locomotive, you may run a passenger from one extremity of our part of the shore to the other in three hours and a half! Then the lateral roads would throw all the meats raised on the interior of the shore to the navigable depots for their natural market, the city of Baltimore; whilst on the other hand the wood, the fruits, the vegetables, to be passed on this road, would go to the depots on the Delaware to seek their natural market in Philadelphia and New York. As return cargoes, lime, plaster and merchandize would come from both sides for distribution down the main stem of the road.

Let me ask you to allow this essay to serve as the rough outline of the plan of the Eastern Shore Rail Road, and in my next I will enter into some calculations which, although rough and hasty, will I am sure nearly approximate to truth to say this road can and will be supported alone by the foreign travel on it; independent both of the mail appropriation which it must and will have, and of the trade furnished by the country through which it passes. I will take leave to say, that, in the consideration of this subject, so vitally important do I consider to the Eastern Shore, it is to be devoutly hoped, that the narrow minded and jealous bickerings of party politics, will be wholly excluded and discarded.

I therefore hope this article will forthwith find a place in every newspaper on this Shore, as all other articles shonld do on the same subject, whether they be for the road or against it. Let all light be shed upon the subject. No time is to be lost, as this subject should be considered by the people, and understood by them, as well as their representatives, in time for the necessary action at the May session.

THOS. EMORY.

From the Richmond Whig.

PASSAGE OF THE MARYLAND INTERNAL IMPROVEMENT BILL.

An extra session of the Maryland Legislature was called, some weeks since, to consider the grand improvement bill for the completion of the Chesapeake and Ohio Canal, and the Baltimore and Ohio Rail Road. The bill passed the lower house on Friday, by a majority of nineteen, and had but two dissenting voices in the senate. The funds of the state are pledged for the completion of these works. This law, says the United States Telegraph, makes Maryland the great thoroughfare of the commerce of the West, and makes her the *heart* of the Union. The news of its passage was received in Baltimore by the firing of cannon, the ringing of bells, and the shouts of joyous triumph!

We take the following summary of the provisions of the bill, from the Annapolis Republican of Saturday morning.

"The law appropriates three millions to complete the Chesapeake and Ohio Canal to Cumberland; three millions to continue the Baltimore and Ohio Rail Road to the Ohio; one million to construct the rail road running down the Eastern Shore from Cecil county to Pocomoke bay; half a million for a canal to connect Baltimore with the Chesapeake and Ohio canal 'by the most northern route;' and half a million to connect Annapolis with the Chesapeake and Ohio canal. It provides for a loan at six per cent. redeemable in fifty years, for the above purposes, upon which loan not less than twenty per cent. premium *must* be obtained, amounting to one and a half million, which will constitute a sinking fund adequate to redeem the principal in——years, all the profits of the several improvements being pledged to the State for the payment of six per cent. interest upon the several sums received by them, after three years from their receiving the same."

ANSWER TO QUERIES RESPECTING HOUSING CORN OF THE LAST CROP.

To the Editor of the Farmers' Register.

Fairfax, June 7th.

Under fictitious signatures I have attempted to throw my mite into the Register, and as far as was within my very humble power, make you some return for the many good things I have received. If I aspired to the station of a public benefactor, I should have given you my proper name; but, sir, I am willing to pass through life so that my "right hand shall not know the doings of my left." If I give you brass, as brass let it go: if I give you gold, surely sir none will require that * * * or "the government" should be impressed upon it to give it currency. Rest assured that when I state any thing as a fact, I shall be ready to make the proof; as for opinions, they may and should only pass for what any may think them worth.

You ask for particulars in relation to my corn cribs (at page 109, vol. 4.) The largest is 22 feet long, 16 feet wide, and 12 feet high. It is framed strongly, and lathed inside with ¾ plank, split into slats 3 or 4 inches wide. The other two are of logs resting upon each other with spaces as wide between the logs as we could contrive, and are 20 feet long and 14 feet wide—lathed upon the outside. My memorandum book informs me that upon the 2nd day of October, I began to husk and loft corn; upon the 8th, I had 250 barrels lofted, and that upon the 30th, one house was filled; upon the 20th November, I find this memorandum: "750 barrels of corn now lofted, 180 rejected and devoted to immediate use, and 20 barrels good, disposed of—making a total of 950 barrels." You also ask what kind of corn I plant. I can only answer that it is the best I have been able to find in 36 years: the ears are large, grains deep and hard, and matured 3 weeks sooner than any other corn I have planted; the stalk is strong but very short, and the shoot is low. I always plough seven-eighths of my corn stalks under, in making ready for seeding wheat: if they were large, it could not be done. My corn kept well—for I am puzzled to get as much bad corn as will feed my hogs.

Our wheat crop is much injured by the fly. My Kinderhook, however, has escaped, and thus far

promises well. It was the only wheat last year that escaped the fly.

The rye crop is now of little value—the oat, though late seeded, is very good—clover will be short, but timothy is very promising—corn may be said to be in chancery—good counsel and hard work may produce good results.

Lime! lime! lime! is now my only cry. I cannot get shells; my only chance is down the canal to bring the rock and burn it myself. In my single glass of wine, I drink "a *calcareous* resurrection to Virginia:" she will then cease to be *old* Virginia. * * *

[The early ripening of the kind of corn made by our correspondent, and probably the greater hardness of its grain, (as the early kinds are always the hardest,) served to make safe his early storing in such large cribs. The ordinary corn of lower Virginia, in the last very peculiar season, could not have been kept in good condition under like circumstances.]

ON THE NATURE, FORMATION, PROPERTIES AND PRODUCTIONS OF ARGILLACEOUS SOIL.

By M. Puvis.

Translated for the Farmer's Register, from the *Annales de l'Agriculture Francaise.*

EDITORIAL REMARKS.

It is but little more than twelve months since we first met with one of M. Puvis' publications—which one (the Essay on Lime) was the latest which he had then sent to the press. Since, we have devoted many pages of the Farmers' Register to translations from that and other of his pieces, some of which were of much earlier date, but which did not come under our view, and probably had never reached this country, until brought by our special order, and in consequence of the high opinion formed of the author's later writings, which had been seen in the last Nos. of the *Annales.* In presenting these several pieces, it is hoped and believed that we have both gratified and informed thousands of readers, (through the various re-publications that have been made,) and have done much to diffuse the knowledge of the value of lime as manure, and to encourage and promote its extensive application. While we have heretofore frankly stated some strong objections both to the matter and the manner of M. Puvis' different essays, we think that all of them are interesting to investigators of the nature of soils, and the action of calcareous manures, and highly valuable to those who are but little informed on those subjects, and are seeking all the instruction that they need to direct their practice. As to the main and most important opinions of M. Puvis, we could not do otherwise than approve them—for it is remarkable how closely they agree with our own, first advanced and maintained (so far as was then known,) in the Essay on Calcareous Manures. The two writers separated by the ocean, and ignorant of each other's labors, and even existence, were during the same course of time engaged in investigating the same class of subjects, and arrived (though often by different proofs, or trains of reasoning,) to the same results. The entire deficiency of calcareous earth in natural poor soils—the certainty of improving such soils by its application—and the impossibility of enriching them profitably without—the *acidity* of such soils—the effect of liming or marling a country to lessen or remove *malaria*, and its consequence, autumnal diseases—all these views are maintained by both writers—and each maintained what he then thought was as novel and unsupported by other testimony, as it was important to be made known.

The following piece of M. Puvis, though the latest to reach us, in fact preceded most of what we have heretofore had translated; and this piece, it seems, is but an abstract or new form of an earlier publication, which has not yet been seen. But though our reading and publishing of the several articles has thus been in nearly a reversed order to that of their original appearance, the injury thereby sustained has not been considerable, owing to a peculiarity in the manner or form of all these several publications, which is in general a great fault, but which in this case, (and very often in other agricultural writings,) is of much use to readers, however offensive to the critic's eye. It is the repeating, in different kindred articles, the same descriptions or opinions whenever the same subjects come under view. Thus the peculiar qualities of the "argilo-silicious" soils, which are the subject of the following article, have been described in the Essay on Lime, and elsewhere, with sufficient distinctness to enable us to know them. Our inferences in regard to them were stated in a note to the Essay on Lime, (page 363, vol. III., Far. Reg.,) and this entire article shows that those inferences were correct. In fact, if M. Puvis had been investigating the nature, and treating of the improvement, of the "ridge" lands of lower Virginia, he could not have more correctly described them, than he has done in describing soils in France. The dividing ridge or level between every two rivers, or tributary streams, in lower Virginia, is precisely like the "argilo-silicieux plateaux" of M. Puvis: remarkable for the same general features of sterility—deficiency of calcareous earth—peculiar fitness for calcareous manures—*and for being more or less subject to sickliness* in autumn. As examples exhibited are more impressive than general description, it may be observed, that the stiffest kind of M. Puvis' "argilo-silicious" soil, (precisely the soil of "*triste Sologne*"—) is presented in the body of land in Prince George county, which lies between Powell's Creek and Ward's Creek, both flowing into James River: that most of the neighboring level ridge lands between other streams, (and through which the mail road passes) are examples of the medium texture: and that below, in Surry, the ridges are more sandy, indeed very light, yet still exhibiting the same general qualities. Every county in lower Virginia (if not elsewhere) will furnish abundant specimens of all these varieties of texture. Though varying greatly as to the predominance of sand or clay, there is, throughout, the same general character. We were, long ago, forcibly struck with this very uniform character of a great extent of

our country, (as described concisely in Essay on Cal. Man. p. 40, 2d Ed.) and thence supposed that there had been a similarity of geological formation, different from that of the lower and more fertile lands intersecting this steril region, and different from that of any other region ever heard of, until we recently met with the writings of M. Puvis, and his description of precisely similar lands in France. We are rejoiced to be enabled to call his support to the aid of improvement in Virginia and other Atlantic States: for all that he says, in this article, is as applicable to our country as to France. Whether his geological views are plausible or not, we are not qualified to decide: but at any rate, they, and the facts by which they are supported, are curious and interesting.

The classifications of soils by writers on agriculture seem to have been hitherto of little utility. Till now they have aimed to class them by means of their texture, or different degrees of consistency; and this method has brought together soils different in nature, properties and composition. Hence it has resulted that the classification, instead of simplifying matters has only rendered them more complicated; and in this instance, as in some others, science, by a classification at variance with nature, has retarded, rather than advanced practice, and has introduced a vexatious confusion into agricultural works and theories. This serious inconvenience would not have occurred if lessons had been taken from practice in this question. Every where experience has taught the husbandman to divide the soil into two classes, distinct in their nature, their composition, their properties and productions: it is this unscientific *(empirique)* classification which should have been followed; and then we should not have been lost among the English "*loams*" of which we cannot ascertain the exact quality, now the "free lands," *(terres franches,)* nor "fat clays;" *(luts gras,)* of our French writers, which also occasion misinterpretations in each country.

The great author of all things, in his supreme wisdom has fortunately varied the comparison of soils but little. Among the vast multitude of simple substance of which the globe is composed, he has scarcely admitted more than three to form its surface—that part destined to support its inhabitants: these substances are silex, alumine, and lime. A greater number of component parts, by diversifying the nature of the soil, would have made agriculture much more complicated—and it is already, in the actual state of things, so difficult an art! If it had been necessary to practice husbandry upon a soil composed of numerous elements, it would have been almost entirely above human intelligence.

Among these three earths, the two first, silex and alumine, form almost the whole mass of the upper stratum, and exclusively compose more than half of it. The silex is found in the form of sand, and the alumine is scarcely ever met with alone, but it exists in the soil under the name of argil [pure clay] clay, always mixed, or rather combined with particles of silex very minutely reduced.

When lime, or rather the carbonate of lime, is found mixed in a greater or less proportion with the two first earths, it modifies their nature in whatever quantity it may be found mixed with them: the compound then takes the name of calcareous soil, and its properties are changed in a remarkable manner.

Sometimes the lime is mixed with a little magnesia, which then changes all the characters of the calcareous soil and most frequently renders it barren.

With these three principal constituents there is found mixed more or less of vegetable mould, *(humus,)* the decomposed remnants of preceding vegetation, or additions made by man to increase fertility; and, finally, a small portion of oxide of iron is very often met with, which does not seem to act an important part in vegetation.

Practical agriculture has learned in each country to divide the soil into *silicious*, and *calcareous lands*.* In Ain, Saône-et-Loire, and Jura, and in a great part of France, the argilo-silicious land, (*terre argilo-silicieuse*) bears the name of *terre blanche* and the calcareous lands receive names which distinguish them from it completely; in the south the argilo-siliceous lands are called *boulbeuses*, and the calcareous lands *terres fortes*, in Yonne they are distinguished as *terre de puisage* and *fortes terres*, in Aveyron the one has the name of *segallas*, and the other that of *causses*; in Berry and the Gâtinais the first is called *terres de Sologne*, in Belgium and the north it is called *terres a bois*, *terres élytres*. In fine, practice has every where given a distinguishing name to this nature of soils, which every where offers the same composition, the same properties, the same productions and the same difficulties in its cultivation.

It is this classification, this distinction of practice that I propose to examine particularly. So long ago as 1811, struck with these two great natural and practical divisions, I published a memoir on this subject. Since then I have felt more and more the great necessity of it, and my present work, which is the study of the first class of soil, of the soils composed of silex and argil will be, in some sort, a developement of facts in support of my work of 1811. Hereafter we shall be able to return to the study of calcareous soils.

Our subject will lead us to some details of agricultural geology, a science yet in its birth, for which as we proceed, we shall collect some materials.

I. The soil of which we are going to speak is not to be confounded with the granitic or schistous soils which cover the most elevated parts of the globe. These last soils offer indeed an analogy of composition and productions with the former; they are also composed of alumine and silex—but they abound in granitic or schistous fragments of various magnitudes, which are not met with in like manner in the argilo-silicious *plateaux*; they produce, as these last, the heath and broom, but the fern does not grow abundantly on them. Their formation is not the same, the exterior characteristics and the sub-soils are different; the granitic or schistous soils seem to have been owing to decompositions of granite or schist on the same spots by meteoric influence; at other times they have been produced by the movement of partial waters in the interior of basins.

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* Here and elsewhere the author uses the term "silicious soils" in contra-distinction from "calcareous"—or to designate soils which are not at all calcareous. We have elsewhere used the term "acid soils" for the same general class.—Ed. Far. Reg.

The argilo-silicious soil, on the contrary, belongs, as we shall see hereafter, to a great deposite which seems to have been general; but which, however, did not rise to great heights. It covers, in France and elsewhere, vast extents, and it composes at least three fourths of our forest lands in the plains; the great forests in the neighborhood of Paris and those of Normandy are almost entirely composed of it. It is the only great shade of soil which is produced every where with striking analogies in its soil, its sub-soil, its properties, its advantages and its defects; while other natures of soil offer great disparities among themselves in the different positions in which they occur.

Its composition, in the first place, as we have previously announced, is completely identical, but it varies much in consistence, and in the faculty of retaining water, according to the greater or less quantity of clay which it contains, and as the silicious sand found in it is in a state of more or less minute division; for the experiments of Thaër, Schubler, and Cadet Gaussicourt, have proved that the stiffness of a soil and its *impermeability* (impenetrability to water) depend on the minuteness of division of the silex, as well as on the proportion of clay that it contains. Silex in the form of coarse sand takes only one fourth of its weight of water, while reduced to an impalpable powder, such as is obtained from clay, it retains nearly three times its weight; which explains, on the one hand, the great humidity of argillaceous soils and on the other the great contraction that clay suffers either by drought in agriculture, or by heat in the arts.

II. The color of the surface of this soil, when it has been long exposed to the air, is white, which has given use to its name of white land, *(terre blanche, terrain blanc.)*

What characterises this soil particularly is that when it is dry, it is easily enough penetrated by water, but when once saturated, it admits no more; the water which then falls upon its surface remains there without being able to penetrate it; this property has caused it to be called *impermeable* soil, because in fact it does not permit the water to pass through to the lower strata.

One of the worst results of this *impermeability* of the soil is the unhealthiness which is experienced in a greater or less degree wherever this soil occurs: the intermittent fevers which are observed more or less on the borders of stagnant waters are very frequently endemic on the argilo-silicious plains, although they may present neither marshes nor ponds.

This unhealthiness, it appears, may be explained in a plausible manner.

The water with which the soil is inundated, not being able to escape in any direction, remains there in a state of stagnation, the general principle of the corruption of water. It forms then in the soil a kind of interior marsh; the sun and the dryness of the air exhale a part. These waters, motionless, diminished, heated by the sun in the warmth of the long summer's days, ferment, become altered, and are sometimes so much corrupted as to become black; they are then an unwholesome drink for men; and at the same time the exhalations of a soil impregnated with corrupted water become unhealthy, as those of the borders of marshes, of ponds, and of all lands temporarily inundated, and which the summer's sun strikes upon, after the waters are drawn off. Then among the inhabitants of a district, in the midst of an atmosphere mixed with deleterious exhalations, numerous intermittent fevers occur, without any necessity for the appearance of marshes or ponds in the country.

III. Almost always under the white [or light colored] upper soil, a sub-soil is found of clayey sand (*sable argileux*) reddish and shaded with gray, or more rarely with red veins.

Its color may enable us to form a judgment of its degree of *impermeability*, and consequently of the degree of humidity of its surface: when the whole mass, soil and sub-soil, is gray, it is more impermeable, and its upper stratum is more wet: when the inferior stratum is reddish or veined, the soil allows the surface water to penetrate a little more, and the upper layer is better drained; it is then remarkable that the gray veins which it contains are more moist than the rest of the mass. The gray color, doubtless arises from the greater abundance of clay, and the red announces a greater proportion of sand, colored by the oxide of iron.

Nevertheless in all its varieties, this stratum retains the water on its surface in a greater or less degree, and allows scarcely any to penetrate into the interior of the soil.

IV. The argilo-silicious formation covers vast extents of the two grand divisions of which France is composed, the basin of the Mediterranean, and that of the ocean. In these two positions, so different, although near, we are unable to assign to the deposites of this stratum shades of difference which may very sensibly distinguish them. That which covers a part of the basin of the Rhone, the only basin of France which declines towards the Mediterranean, presents, then the same characteristics as in the other parts of this country which decline towards the ocean. Nevertheless, in the basin of the Rhone, the alluvion may be more clayey, a property which it shares with all the different strata of the surface of the soil in this basin.

The cause of this may be attributed to the numerous formations of gray clay, which we shall call granitic clay, that are found in this basin; and besides, to this circumstance, that the river which occupies the bottom of this basin having a much greater descent than those which flow to the the ocean, (since Geneva is 300 toises above the level of the sea, consequently in a course of 120 leagues the river falls 300 toises,) the soil there has been more profoundly agitated, the plastic clay has been dissolved in greater masses, and has given more stiffness to all these strata of the basin, and first to the argilo-silicious formation.

V. This formation, generally, covers the *plateaux*, [ridges, or table lands] which separate the basins of great rivers, whenever they are not divided by elevated mountains; and when mountains divide them, this formation often rises on their slopes to very considerable heights. Thus it is found on the first steps, or ascent, of the mountains of Autumnois; it is found covering the granites of a part of Haut-Charolais, of the mountains of Forez, and rising to almost equal heights on the two slopes of those mountains which decline, on the one side to the Loire, and on the other to the Rhone—that is to say, to the ocean and to the Medeiterranean. But then the difference of stiffness is sensible between

the formation on the side of the ocean, and that on the side of the Mediterranean.

It is found at an almost equal height in the environs of Lausanne in Switzerland, of Thonon in Savoy where it rises above the alluvions of the borders of the Lake of Geneva. The great argilo-silicious table land of the basin of the Rhone, which from the gates of Lyons, covering a part of the departments of Ain and of Saône-et-Loire, reaches to the middle of that of Jura, rests on elevated *chaussées* of the granites of ————————* near Lyons: and what is very remarkable, is that, as we have said elsewhere, the general declivity of this *plateau* lies in a direction contrary to the course of the rivers which border it; that it goes on increasing in this direction for the 20 leagues of its length, so that the *plateau* towards the heights of ————————* ends by rising nearly 100 toises above the course of the rivers which bound it on the two sides.

VI. The fragments of rocks which this formation contains, are always pieces more or less rounded by the movement of waters, and the largest are generally found at the greatest depth. The strata are always horizontal, the sand is almost always coarser in the inferior strata, and its grains are successively finer up to the surface, where they are very minute. All these circumstances evidently indicate successive precipitations from a liquid, in the bosom of which the suspended earthy particles have been at liberty to obey the law of their gravities. It is then an aqueous deposite which has extended itself over vast surfaces. Nevertheless, it is not to be believed that this deposite has been for a length of time carried along by the waters before its precipitation, for it frequently contains fragments whose angles still remain and which have not been rolled long enough to become round. In the basin of the Seine the flints of chalk beds, which are there met with with still preserve, in part, their native forms; and the fragments of mill-stone *(silex carié)* which are found in Sologne are not yet rounded, although they have been rolled; and finally the rolled flint-stones which are found in the argilo-siliceous deposite of the Rhone belong to the ancient alluvions of the basin, and have not received their form in the various movements of the deposite in which they now occur.

VII. Every where this stratum covers the great formations and is no where covered by them; it is then evidently the last of the great alluvions of the last great revolution which has agitated the surface of the globe.

VIII. It does not appear possible to attribute it to fresh waters, to the formations, always partial, of river waters, which take a distinct character in each basin, and generally occupy its bottom. We do not find in it the fresh water remains so numerous in marls, as well the stony, as the earthy kinds; and, besides, when the basins of rivers are not separated by mountains, this formation, occupies the whole extent of the intermediate ridges or table lands. Finally, the alluvion placed in the basin of the ocean rises on the slopes of the mountains to the same relative height as that placed in the basin of the Mediterranean; and where these mountains are depressed, the strata of this alluvion unite, and are confounded.

This stratum of identical composition which covers such vast extents in countries distant from each other, which has risen above the basin of rivers, which unites the basins of seas, can, it seems only be owing to the last phasis of the movement of great waters, of the movement of seas themselves confounded together.

It is true that few marine remains are met with in this stratum: the few petrified sea-urchins, which are found in Sologne may there be contemporary with the beds of mill-stones which crop out through the argilo-silicious stratum, and the formation of which rises far beyond that of the deposite by which it is covered.

IX. This stratum must then have been deposited by the water over the whole surface; and it would not be difficult to explain how, while continuing to cover the ridges and table lands, it may have disappeared from the bottoms of the basins which it covered. When, by a course of which we are ignorant, the level of the inferior waters was lowered, currents were formed in the interior of the basins of the rivers which terminated in the great reservoirs; the waters quitted the high lands, to collect together in the basins, their natural bed; the waters of the elevated parts of the table lands, to reach their respective basins acquired but little rapidity in their courses of short extent, and only carried off more or less of the last deposite, which was not altered in its composition. But it was not the same in the bottom of the basins; there, rapid currents of great length were established; and impelled by the waters above, they swept off the last deposite and mingled its elements with the deposites of the inferior strata.

When the waters became less rapid, the fragments which they carried along, were successively deposited, commencing with the heaviest; and as they approached a state of repose, the minute particles which the waters retained in suspension were precipitated, and formed the upper stratum, which has become the vegetable stratum [or mould] of the lower part of the basins, and which is composed of fragments of all the formations carried off by the the waters, the latest as well as the most ancient.

X. This is the place to remark that the argilo-silicious deposites which cover the *plateaux*, generally increase in stiffness as they approach the sea; thus, in the basin of the Loire, the sands of the Sologne are lighter than the same kind of table lands of La Sarthe; so also, in the basin of the Seine, the table lands of the Gâtinais, and of the forest of Fontainebleau, are less stiff than the analogous ones of Bernay, and of the forest of Larche in Normandy.

The causes which have brought about this state of things may be conceived: the sandy particles must have been first deposited, and have formed the alluvions of the more elevated parts of the basins; the waters on retiring have left them successively exposed, and the fine and clayey particles, remaining last in suspension, have been progressively more numerous in the deposites as

* These blanks occur in the French publication and probably were made necessary by the illegibility of the manuscript. In the several pieces by M. Puvis, as published, there are numerous indications of mistakes of the author's words; and sometimes others of his meaning—so manifest, that the translator has ventured to alter them.—Ed.

they approached the sea, and consequently have rendered the alluvions more stiff, more clayey. Thus the soil of the borders of the Seine which often shows little stiffness at Paris, acquires more as it approaches the sea: and in like manner the *littoral* soil of the three rivers, the Rhone, the Saône, and the Aisne, is lighter before their confluence, than that of the Rhone in Comtat, and that of Comtat is less clayey than that of the great plain of Arles: these facts are explained in the same manner as the preceding.

XI. Finding myself involved in the great questions of the formation of soils, I shall not hesitate, at the risk of digressing from my subject to collect here many important facts in agricultural geology.

The argilo-silicious deposite has been very evidently the last of the great deposites which have covered vast surfaces: it is, in some sort, the last phasis, or general movement of waters, on the surface of the earth; but since then, partial revolutions seem to have taken place in the basins of large and small rivers; there are even some to which we seem able to assign an era, and which do not go beyond the historical ages. Thus many positive and very remarkable facts may induce an opinion that in the basin of the Rhone a great movement of waters must have taken place since the establishment of the Roman dominion in this country. When wells are dug at Marseilles, water is found under a stratum of gravel about 20 feet thick, at its junction with another formation on which we meet with traces of habitation, roads, Roman, Phœnician and Gallic medals. This level of the soil has then been inhabited, two thousand years or more ago, and consequently the stratum of gravel more than 20 feet thick which covers these parts of the basin has been brought into them since, by a movement of waters which no historical recollection recals.

But if we remark further that in ascending the basin of the Rhone to Arles, to Orange and Valence, to Nîmes, to Lyons, the traces of Roman inhabitation are evey where covered with a stratum of gravel many feet thick—that at Bourg, situated in the same basin, are found medals, instruments of a contemporary date and of the same sort as those met with at Marseilles, and every thing which characterizes an ancient level of habitation between two strata of gravel analogous to those which cover them elsewhere—we shall have good reason to believe that the stratum above the medals which have been found, must be owing to the one same revolution, which consequently must have changed the whole face of the lower part of the basin of the Rhone.

This stratum at Marseilles, and in the greater part of the places where it occurs, cannot be owing to the ruins of habitation, to the rubbish of destruction, which raises the inhabited surface in populous cities; for the traces of habitation, the medals, the roads, mould (humus) bricks and pottery, in angular pieces, would be found throughout the whole thickness of the stratum, whereas this is composed without mixture of rolled pebbles of silicious gravel of the same kind, covering calcareous gravels disposed in horizontal strata, identical in thickness and in composition, which could be owing only to a natural formation deposited from the bosom of the waters.

But still farther traces of this inundation are found. At the junction of the basins of the Ain and the Rhone, there exists a great plain which bears the name of Valbonne, *(Vallis Bona;)* a name evidently given by the Romans, and of which the soil is now composed of an arid stratum of silicious gravel like that which is found all along the basin of the Rhone; but we should consider as certain, that this stratum did not cover the valley when it received the name of *Vallis Bona;* it may then be believed, that the alluvion of good quality which covered this valley, was carried off by the great flood which has thrown over a great part of the surface of this large basin, all those increments of gravel which have covered and devastated the inhabited surface. In support of this conjecture, we find in Bas-Bugey at Meximieux, and in Dauphiny, at Saint Priest, opposite the plain in question, a stratum of calcareous soil of good quality, which often rises many feet above the alluvion of gravel, this stratum, which at several points bears traces of having been torn away, rose, it may be believed, above the borders of the Ain and the Rhone; it covered, consequently, the plain between Meximieux and Montluel, and gave occasion to its name of *Vallis Bona,* which was preserved to it after the waters had deprived it of its qualities. An aqueous revolution then has taken place in the basin of the Rhone; this revolution must have been subsequent to the establishment of the Roman power, and to this revolution the stratum of silicious gravel succeeded, which from the borders of the lake of Geneva, to those of the sea, covers such vast extents.

We shall not continue farther the discussion of this important question of agricultural geology, for fear of exceeding the proper limits of this journal.

XII. In all movements of great waters which have taken place, each basin of a river has formed a new upper stratum which has become the vegetable stratum (or surface soil;) and this is distinguished by shades of formation which are peculiar to itself, and which it has received from the fragments of the mountains which border upon it, from those brought by the waters of its confluents, mixed with the great general deposites. Thus are explained those analogies of soil and of formations which are found throughout the whole extent of any one basin, and in the secondary basins themselves.

We have designedly gone back to the origin of these analogies of soil, that we might recur to an important idea in agriculture. It is this: that the formations in any one basin being composed of the same fragments, and owing to the same revolutions, the soil of these basins presents throughout their whole extent a great analogy, and consequently, the practices of agriculture which have succeeded in one point, may be applied, the difference of climates excepted, to the analogous formations; agriculture perfected on some points of a basin, may give lessons almost certain for its whole extent.* Thus the study of agriculture, to

*It may not be useless to all readers to say, that by the "basin" of a river, the author does not mean merely the valley or lower lands through which it flows, but the whole area, high and low, which lies within, or is intersected by, all the tributary streams of the river. Thus the basin of the Mississippi takes in the immense area from the summits of the Rocky Mountains to those of the Alleghany.—Ed.

become more profitable, instead of being made according to a political association, by Departments for example, ought to be made by the basins of rivers; it would give rise to many fewer mistakes, and consequently, to much more success. The rules and successful practices of a basin, should be studied anew, if we wish to make an application of them to another basin in which the composition of the soil is owing to different circumstances.

XIII. This caution, this fear of mistakes, ought to have its full effect when agriculture is practiced on the great argilo-silicious deposite which covers such vast extents, and presents every where the greatest analogy. The practice of agriculture on this deposite, might then have general rules which it would be very important to collect; but it must first be well characterized, in order that it may be every where known. We shall therefore resume the course of our observations.

The soil and the subsoil of this stratum, although of different shades, appear to be of identical composition, as experience daily proves in a striking manner. When by any circumstance the whitish stratum of the surface is removed, so as to leave only the reddish stratum of the sub-soil, some years of cultivation and manuring, or even of spontaneous vegetation without culture, are sufficient to give to this reddish sub-soil the gray color of the rest; and, in the same manner, when this reddish earth is carried out on a cultivated soil, the shade which it gives quickly disappears by mixture with the rest, and by the effect of cultivation.

The proof of this identity is still more complete, if we remark that in digging into the lower parts filled up by the falling of more elevated portions of the soil, we find the red soil shaded with gray, or the gray shaded with red veins in the middle of the rubbish; which proves the new increment, with all the characteristics which it has elsewhere, its stiffness and its *impermeability*.

The sub-soil and the stratum of the surface, are then nearly identical, its formation throughout its whole thickness is therefore the production of the same aqueous revolution; only the oxide of iron which colors the sub-soil, loses its color by cultivation.

XIV. The effect of frost upon this soil characterizes it in a peculiar manner; the water at the surface when it is in no great quantity, often freezes in vertical threads which sometimes rise six inches, and resemble a vegetable growth. But what is still more remarkable, is, that the soil rises up by freezing much more than the greater part of calcareous or alluvial soils. New vegetables, planted, or even sown, are torn out of it in a manner truly astonishing; plantations of wood of that year, or even of the year preceding, were torn out at two different times by the freezing without snow, in February, 1831; and sowings of sea-pines, *(maritimes,)* made the year before, were thrown out of the soil. It is therefore prudent to wait till the end of winter to make plantations in such soils, and not to dig the holes beforehand, that water may not get into them and remain; and as the effect of frost is less sensible on the parts covered with turf, the little holes, after planting, should be re-covered with turf, to prevent as much as possible new losses.

The rising of this soil from freezing, occasions besides the great inconvenience of much deeper roads than on calcareous soil.

These effects are explained in a plausible manner from the nature of the soil itself. This soil contains much silex in a state of very minute division, either free or combined with the clay; this silex as we have seen, takes a greater quantity of water than other descriptions of soil; the water which penetrated this soil expands, as we know, by freezing; it expands then at the same time the soil which it penetrates; the expanded soil rises up, and raises with itself the plants and their roots when they do not reach to great depths.

The surface of the soil in thawing first, and losing a part of its water by evaporation, is contracted and sinks upon the rest of the soil, and leaves exposed a part of the roots which cannot descend again with it because their extremities are fixed in a soil still frozen: the next day this effect is renewed, and the plant is soon partly or entirely out of the ground, according to the length of its roots.

The rising of the soil is greater in proportion as it is more clayey, because then it contains more silex in the state of impalpable powder, or it absorbs more water; it is greater than in the ordinary calcareous soil, because carbonate of lime receives only 85 per cent of water to 100 of impalpable powder, while silex takes 280 per cent. There are, however, some calcareous soils which also greatly expose the roots of vegetables; these are the marly (*marneux*) calcareous soils; thus, in the freezings without snow in February last, our calcareous soils of the plateaux, whether *terres-mares*, or our marled lands, had more plants thrown out than our common white lands, *(terres blanches.)* We attribute this to the fact that our *terres mares* are nothing more than a mixture of the argilo-silicious soil of the plateaux with the inferior marly stratum; but our marl which contains commonly 40 per cent. of carbonate of lime, has 60 per cent. of clay or very fine silex, while our white lands contain a great deal of silex in the state of sand. Our *terres mares* and our marled lands, contain then, relatively, more fine silex than our ordinary ridge or table lands, and for this reason may expose the roots of plants still more.

XV. But with the same sub-soil, almost always clayey, the surface varies much in stiffness and tenacity: it passes from a state the most tenacious, and the most difficult to work, to the lightest sand, which is carried off by the wind; and yet under all these diversities of soil, there is found almost every where the *impermeable* red sub-soil.

When the upper soil is clayey, it is then *accidenté*, formed of a collection of small basins or ponds, which serve to drain it; the waters have not levelled the surface, or rather after having levelled it, they attacked it in places, and formed in it basins or hollows which receive the water of the surface, and without which it would be impossible to cultivate it.

In this case, it may be conceived that the soil and the sub-soil are in their nature clayey, of an *impermeability* almost absolute; this soil is also very wet, since it contains a great deal of fine silex, which absorbs 280 per cent. of water, and to derive advantage from it, the cultivator is obliged to add to its natural declivity by artificial beds or ridges by the plough. Wheat, rye, and most agricultural productions, succeed more or less upon it when the drawing off of the superabundant water has been effected.

The dog's-tooth grass, *(chiendent,)* agrostis stolonifera, *herbe trainasse*, the little motherwort *(matricaire)* prey upon this land and impose on it, as an absolute condition of production, the necessity of a very careful cultivation; such is, mostly, the great *plateau*, which extends from the gates of Lyons into three departments, the Ain, Saone-et-Loire, and Jura; such are nearly, also, Puysaie in Yonne, a part of the plain of Forez in Haute-Loire, and the part of Sologne in the Cher and Loire, where fish-ponds are found.

But if this soil, to yield produce by cultivation, requires to be carefully drained, the necessity for this is almost as great to produce woods with advantage, especially in the most clayey variety; without this, on its surface covered with little pools, without mellowness and without strength, the greater number of large vegetables languish; the oak. particularly, is frozen on it almost every year. Then it becomes necessary that ditches, judiciously placed, may collect and carry off the superabundant waters of the surface: with this care, the aspect of the soil changes, large vegetables grow with natural vigor, and are no longer subjected to any other than the great general accidents depending on temperature and climate.

XVI. The elevated parts of each *plateau*, when the waters have had less effect, are generally of a level and sandy soil on the borders, the lower parts are the most *accidentées* and of stiffer soil. Thus in the great *plateau* or basin of which we speak, Bresse is more moist, more clayey, more *accidentée* than Dombes, which is at once more elevated and more sandy than it; and it is the same case elsewhere in the same soils.

But this great *plateau* which belongs to the basin of the Rhone, appears to be the most wet of all those of the same nature which are met with on the French soil; nowhere is it necessary, as with us, in order to derive a profit from the soil, to cut it by perpendicular ditches into small pieces ridged in the middle, to increase thus the natural declivity by artificial slopes, and finally, to add to all these labors, cultivation by bedding or water-furrows. But what increases still more in our country the difficulties of cultivation, are the rains, amounting to 45 inches annually, which keep the surface of a soil, that does not allow the water to penetrate to the interior, in a state of inundation, unless the flowing off of the moisture is hastened by artificial means. And what is very remarkable, is, as we have just said, that the soil is more clayey in the low parts of the *plateau*, where the waters appear to have carried off a greater thickness of the strata. Thus, the soil of Bresse is more clayey and more troublesome, and difficult to cultivate than that of Dombes; in Dombes artificial ridging is less necessary; ploughing in raised beds is generally sufficient to drain off the water; and sheep succeed there, while they perish almost every year in Bresse.

Fish ponds succeed well only in this clayey variety of soil; the greater part of those which were in a calcareous soil, are now dried, and yield a produce in grain and forage much superior to what they did in fish.

XVII. Two conditions are absolutely necessary for this manner of employing land, (for fish ponds,) and these are found united only in the clayey variety of this soil. The first condition is a very great slope, and the second, an *impermeable subsoil*. For a good pond of some extent, there should be 8 or 10 feet of water near the dam, and consequently, at least 8 feet of slope in the surface, from the commencement of the pond to the dam; a slope certainly very great, and which is hardly to be found except in the beds of torrents.

To keep the pond full during the summer, when there is little rain, which is absolutely necessary for the preservation of the fish, it is in a manner indispensable, that the inferior soil should retain the water, and should, consequently, be *impermeable*.

XVIII. Most frequently, when the soil is light, the surface is level, it is hardly ever inclined: there is only a slight slope on the nearest water courses; consequently, in such places, there are no fish ponds; the soil, indeed, still rests, almost always, on the *impermeable stratum;* but it is often at so great a depth, that the surface which suffers from wetness in rainy weather, suffers also from drought in dry, warm seasons.

These two varieties of land, the clayey and the light, although of the same nature and of the same formation, may be distinguished from each other, the first by the name of *argilo-silicious;* and the second, by that of *silicio-argillaceous* soil.

Fish ponds in the plains of the light or *silicio-argillaceous* lands, are evidently impossible, unless they could be established on the water courses which traverse them; which would destroy all the resources of the country in forage, by covering all the meadow lands.

It is of this variety of soil that is formed, in part, the *plateau* which separates the basin of the Seine from that of the Loire, which contains such vast extents of wood, and some cultivated parts; on this *plateau* are found the forest of Fontainebleau, and that of Montargis.

Such is also the part of Sologne, in the basin of the Loire, from Gien almost to Bourges, and which separates the Cher from the Loire: it forms a great *plateau*, which rises on one side above the vale of the Loire, and on the other, above the basin of the Cher; such are all the *landes* [sandy plains or deserts] of Bourdeaux, and a great part of those of Bretagne and of Maine. In this kind of soil, rye, buckwheat, and some fields of potatoes, are almost the only productions of the cultivated lands.

Sheep, which succeeded ill, or not at all, on the argilo-silicious lands, are often in the silicio-argillaceous lands, the only means employed to derive a profit from the soil. On these, the oak often succeeds well, and suffers less than on the other variety of soil, but the chestnut is the preferable tree.

XIX. On all the varieties of this soil, provided it is drained, resinous trees seem to become naturalized, and often grow even more rapidly than in the mountainous countries where nature seems to have placed them exclusively. In this soil, where the richest harvests are refused to the cares and labor of man, all the families of resinous trees often prosper better than in our gardens The larch and the forest pine *(sylvestre)* the sea-pine and the laricio grow vigorously over the whole extent of this soil, when it is laid dry, and the pine *du lord* seems of all to be that which best withstands the wetness. These make an excellent alternation with the deciduous (*feuillus*) trees. A single generation of these large trees, after having enriched

man with its productions, often suffices to accumulate upon the soil many inches of productive mould.

I shall not repeat here the observations which I have already made elsewhere upon this soil, the nature and properties of which, appear to have been hitherto so little attended to; however, it is necessary to repeat that in consequence of the impermeability of the soil, the *plateaux* which are formed of it, centain but few springs; because, in the first place, the rain water cannot penetrate into the interior to form and maintain reservoirs to supply them; but especially, moreover, because the interior waters cannot, but with great difficulty, escape through the impermeable stratum, to arrive at the surface. It is probable that in this soil which confines the water, Artesian wells, to give it a passage, would have a better chance of success than elsewhere.

These table lands, having in general some declivity, enough of rain water rests on the surface to injure vegetation, but not enough to form marshes. Marshes proceeding from interior water—from waters below the impermeable stratum, are then also very rare, and can only be met with in this soil, when the impermeable stratum in the bottom of the basins happens to be mixed in places with gravel, which renders it permeable.

The small number of marshes which are found in this soil, are placed in the basins of water courses where the impermeable stratum has been diluted or modified in its nature; they are of small extent, and could be easily drained, because the *plateaux* themselves have, generally, a very sensible slope.

These water courses, destined to receive the water from rains, and especially from the springs of a district, are then also very rare in these lands without springs; and those which are met with, are rapid, and have hollowed out deep valleys; because, the bottom of these valleys tends to come upon the level of the great rivers which flow at the foot of the *plateau*, and because the plateaux most frequently rise several hundred feet above the level of the rivers, the argilo-siliceous alluvion of these basins has been often entirely carried off.*

XX. When the argilo-siliceous alluvion is left to itself, the herbage, which elsewhere covers the soil with a close and lasting carpet, comes up upon it weak and thin; and when the surface is badly drained, its wetness is favorable to *carex* and other species generally of little substance, and even these grow badly and slowly; they are often found accompanied by a variety of moss, which covers the surface, and still more the subsoil when naked and exposed, with its whitish foliage. When the soil is better drained, heath, broom, *(genet)* sheep sorrel, spurry, (*spergule*) fern, the peculiar and exclusive vegetables of this soil, take possession of the surface at the expense of other growths. Sheep are here supported better than on the poor herbage of wetter soils; other cattle also feed and live upon it nearly throughout the summer. The soil derives remarkable advantages from these vegetables which it nourishes: man believes that he has a right to complain of them, because they present obstacles to its cultivation; but these species, larger than the feeble grasses of turf, leave more dead remains or litter on the soil, and by a happy foresight of nature, these remains are decomposed with difficulty in this inert soil, assume the character of acid mould, (*humus acide*,) and form future resources for this unfruitful land.* The plants, of the production of which we complain, are then of great benefit to this soil, or rather to us: they have changed the nature of the soil, they have furnished to it the mould (*humus*) which alone distinguishes it from its arid sub-soil, and have rendered it at last capable of producing the larger vegetables—the trees which cover it in a great many places. But in a few generations, when the previous growth of heath, or of other plants natural to this soil, has not accumulated great resources, this succeeding growth of trees is soon exhausted. It happens, then, often in this soil, which receives few of the principles of vegetation from the atmosphere, that the whole growth of woods languishes and disappears quickly from the surface; then reappears the alternate cover, or shift (*assolement*) of small plants, the producers of acid mould—and the soil, by these means, stores up new powers for

* And with it, the beds immediately beneath, which have not offered resistance to the flood—such as the marly beds. The surface soil, or mould, of the bottom of the valley, rests then upon plastic clay—a bed more firm, which is not washed up by, and its particles suspended in water, and which has therefore better resisted its force, than the beds of other earth that were super-imposed.—Ed.

* Instead of the plants above named, (which, except sorrel, are not indigenous, and perhaps not known here,) let the reader suppose to be substituted the names of our broom grass, the poverty (or hen's nest) grass, pine leaves, and whortleberry shrubs, and the description and the general remarks will suit well for our poor ridge lands, either in woods, or cleared for tillage and again "turned out." These poorest of our natural soils alone, of all in this region, present an accumulation of vegetable matter, so great as to be even injurious to cultivated crops—and which, in that respect exhibit many points of resemblance to the *peat* soils of Britain, which are unknown in our warmer clime. But it is not merely because the vegetable products above named are slow in decomposing, that they are thus accumulated on our author's "argilo-silicious" lands, or on what we have elsewhere termed "acid soils." The acid ingredient, or property, of such soils, is itself *antiseptic*, and therefore tending to preserve from decomposition all vegetable matter in contact. Soils made calcareous, of course lose all acid quality, and the decomposition of these, or any other vegetable remains, proceeds rapidly. Possibly, this action of calcareous earth is not merely negative—that the effect is not caused merely by its neutralizing and destroying of the antiseptic acid—but that calcareous earth may also possess a positive *septic* action, which serves to aid and hasten the decomposition of vegetable matter. Many persons, who have not been guided by reasoning, chemical knowledge or research, have formed this opinion, from observing the rapid and entire disappearance of the fallen leaves on the rich limestone forests, compared to the great and permanent accumulation on the poor wood lands of Virginia. See *Essay on Calcareous Manures*, 2d Ed. p. 31, and Ch. 8 throughout.—Ed.

new productions. In this great rotation of Nature's crops, the ages of man count but as years.

Among these soils there are some, however, more happily endowed. The natural rotation then takes a different character: the larger plants continue to live upon them; different characters of these plants only, are replaced by others, and the different families succeed each other. Thus on good mountain soils we see the beech and the resinous trees succeed each other in turn, as on good soils in plains we see the birch replace the oak, which soon reappears itself after one generation of the birch.

XXI. With this great analogy in all the principal points which distinguish these soils, with their identity of composition and of production, we still, on each particular body of table land, or ridge, (*plateau*) meet with circumstances which appear peculiar to each district, and which it is perhaps important to remark. Thus on the great argilo-silicious plateau of the basin of the Rhone, as it rises towards the south and approaches Lyons, it loses the name of Bresse to receive that of Dombes; its soil becomes more sandy, lighter, and less wet, on a great extent of soil. In the most sandy and least wet parts, one of the grasses, the *anthoxanthum odoratum* takes possession every year among the rye, and covers the earth like a carpet. After harvest it blooms, and its numerous heads exhale a cadaverous odor which infects the atmosphere. Some persons are inclined to regard this odor as the principle of the endemic fever of the country; but the fevers prevail where the soil is not covered with the *anthoxanthum*.

Is this *anthoxanthum* the same variety as that of the botanists? The heads, the flowers and the leaves have a great resemblance, the odor of the two plants when bruised, is little different, the smell of the flowers even has some similarity: yet there would be, apparently, good reason to doubt their identity. The plant so called by botanists, is one of the earliest blooming grasses in the spring, and that of Dombes blooms at the end of the summer: that of the botanists has an odor which is in request to give a perfume to hay; its stalks and leaves often rise above a foot; that of Dombes only covers the soil, its flowers rise scarcely 6 inches, and give out a smell almost intolerable to those not habituated to it. Finally, that of the botanists appears to be long-lived, while that of Dombes can hardly be biennial, for it cannot establish itself in the soil in the course of the year preceding the rye during the fallow-ploughings; it must spring up, at the earliest, in October, with the rye itself, and last three months longer than it, for at the end of October its plants are almost all dry.

If there are two different varieties, it would be still uncertain whether the smell of that of Dombes were natural to it, or arose from the climate and soil which produced it. Could this soil, in which the interior waters are corrupted at the time of the flower's blooming, injure also the odor of the plant? If the two plants belong to the same variety, the question would be decided; the alteration of odor would be owing to the state of the soil at the end of summer.

XXII. What particularly distinguishes the argilo-silicious soil from alluvial soils, and others of good quality, is, that the sub-soil, which, as we have seen does not differ from the upper straium, is entirely without vegetable matter, while we see in alluvial soils, and even in calcareous soils, mould occurring below the soil, or vegetable surface stratum. Here, there is only a barren clayey sand. Also, while in other soils, vegetables sink their roots to seek nutritive juice below—in this soil the roots run without sinking, because there is nothing to be found below the stratum exposed to the atmospheric influences. This circumstance explains, in a plausible manner, the quick exhaustion of the surface in trees on white land, (*terrain blanc*) and consequently their disappearance after a longer or shorter period of vegetation. It is for this reason, that, while in good soils trees often do little injury to crops, and sometimes even afford them advantageous shelter; in the soil of which we speak, they consume the resources of the surface, starve the surrounding vegetables to some distance, and wither them up, especially during the heats of summer. It is thought sufficient to account for this, to say, that "the shade *burns*." Yet, this ought to have quite a contrary effect, since it evidently shelters from the heat of the sun. But if we remark that this effect takes place in all exposures, that it is more sensible on the south side of trees where the shade does not fall, than on the north, which is often shaded, and that this effect does not occur in deep soils into which the roots descend, while it exercises all its ravages on shallow soils, where the roots run far to draw from the surface; if, lastly, we remark that the evil is much greater during droughts, that it shows itself much sooner on these points than elsewhere, that the evil is seen in the withered leaves of the vegetables, and with all the symptoms produced by drought, we should necessarily conclude that this effect is owing to the absorption of the humidity of the soil and of some vegetable principles, by the spreading roots of the tree at the expense of the crop covering the soil.

But a very conclusive fact confirms this explanation, already so plausible. A row of poplars planted on the edge of a field damaged the crops very much. I caused a ditch to be dug so as to cut the roots of the poplars; the following year, the crop of wheat on one part, and of clover on the other, was finer in that portion of the field which the trees generally starved, than on all the rest of the field. It must, therefore, have been the roots, and not the shade, which injured the crops, and the roots, therefore, absorbed the humidity much sooner than they consumed the vegetable juices of the soil. Yet, I would not admit that the nutritive juices could have accumulated in the soil which had to nourish, at the same time, the trees and the crop; but I think that the decaying remains of the roots, having become a vegetable nutriment, gave the advantage to those portions of the field which they formerly injured.

XXIII. This kind of soil, it cannot be dissembled, requires great intelligence and constant labor to render productive. It is for this soil that the proverb was made, "*tant vaut l'homme, tant vaut la terre*," (as man is, so is the earth;) but with great care, much labor, and abundant manures. (*engrais*) it may be raised to a production which compensates the trouble and the outlay.

What particularly distinguishes the argilo-siliceous soil from calcareous soils is, that in these last, crops without (alimentary) manure (*fumier*) grow, feebly it is true, but without appearing to

exhaust the soil in a sensible degree; in the other, without manure they will scarcely grow at all. To make this soil productive, there is absolute need of a stimulant to develope its vegetable powers, and the effect of the (alimentary) manure consists as much in stimulating the soil and the vegetable organs, as in supplying them with nutritive juices. When an equal quantity of manure is given to these two soils, so different in their natures, that its effect on the calcareous soil is perhaps twice as great as on the siliceo-argilaceous soil; whence we should naturally conclude that the faculty of imbibing the principles of vegetation from the atmosphere, is much more powerful in the calcareous soils, and the vegetables it produces, than in the argilo-siliceous soil, and it is that which constitutes their greatest difference.

XXIV. But this important faculty, which nature seems to have refused to this soil in its formation, man, by a happy compensation, may give to it, with all the properties and all the advantages which distinguish calcareous soils. If he covers this soil with marl, if he applies to its surface a certain quantity of lime, or sprinkles it with ashes, or even confines himself to burning its surface, then the nature of the soil is changed; an unusual fertility appears—(alimentary) manures act upon it with more effect, and the soil receives that happy impulse which, when it is extended over the whole surface of a country, changes its entire aspect, and produces in it agricultural wealth, the assured source of prosperity, strength and population. Lime, and the substances which contain it, would then be a very powerful means of vegetation on a soil which does not contain them; spread so as to form scarcely a two-hundredth part of the cultivated stratum, it increases with the ordinary quantity of manure all the productions more than 50 per cent., during a period of more than twelve years. The calcareous particles which it furnishes to the vegetable texture, are not a millionth part of the product itself, since lime does not form a moiety of the weight of the vegetables reduced to ashes. This surplus of production which is not furnished at the expense of the soil, (since at the end of twelve years it will still be richer than before the application of the alimentary manure,) and which does not come from the very small portions of the substance of the lime, (which does not form a millionth of the production,) comes then from the atmosphere. The soil and the vegetables which it supports, have then received from the lime, and from its mixture with the vegetable stratum, the faculty of imbibing from the great reservoir of vegetable elements, carbon, azote, oxygen and hydrogen.

We shall not now expatiate farther on the subject of improvements by calcareous substances: they demand a longer and more particular explanation which will find another occasion.*

XXV. Let us return to our principal subject. As we have said elsewhere, by a fortunate and beneficent harmony, the formation on which the argilo-siliceous soil rests is calcareous, and contains marl in great abundance; there is not within our knowledge an argilo-silicious *plateau* in which marl has not been found at a greater or less depth; generally, it is found where the ridge or table land ends on reaching the alluvions of the basins, and in the inflexions of the soil where the waters have carried off a considerable part of the deposite.†

On a great portion of the surface of the *terres à bois, terres elytres* of Belgium, and of the Department of the North, marl has been found. In Picardy, it is brought up from some depth; on the table lands of the three Departments of ancient Normandy, it is sought at a depth of 100 feet, even of 200 feet from the surface; Puisaye obtains it on the surface (in out-croppings) and Dauphiny at a slight depth.

Our great *plateau* which extends into three Departments, shows it on the borders and in the basins of the streams which water them. On most of the great *plateaux* which border on the Loire, and which form a great part of the soil of a dozen Departments, marl is frequently met with, and is in many places successfully employed. The *boulbins* of Toulouse have it also, and make use of it with great advantage.

Finally the plateau which forms the Gâtinais and Sologne, which declines partly to the Seine and partly to the Loire, rests every where upon calcareous deposites. Marl is found either on the edge of the plateau, or at a little depth in its first portions, or finally in the basins of the streams which water them. We may then regard it as certain, that generally, there prevail under the argilo-silicious deposite a calcareous formation and deposites of marl, which when brought out upon the surface may give it a fertility almost equal to that of the most favored soils.

Nevertheless, sufficiently numerous observations have often shown me a stratum, not calcareous, but resembling, in its exterior characters, the earthy marl, on the nature of which chemical tests alone have been able to undeceive me. This stratum, which is nothing else than what we have distinguished by the name of plastic clay, is met with from time to time on the table lands, and in the spots where we may expect to find marl; but it is still more frequently found at the bottom of brooks, where it serves as a sub-soil to poor meadows. I have found it sometimes in cysts (*sacs*) with marl, and by its side. I have never met with it upon the marl, but often below it: the plastic clay should then be subordinate to the calcareous stratum, as this last is to the argilo-silicious stratum, and we should hence conclude that where the plastic clay is met with, the calcareous stratum is wanting—has been carried off—and consequently marl will not be found.

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*And which has been already presented to the readers of the Farmers' Register in Vol. III. in M. Puvis' essays on lime and marl.—Ed.

†Even in this important respect, the resemblance holds between the argilo-silicious lands of the author, and the "acid" ridge lands of lower Virginia, and probably of Maryland and North Carolina. Though not the *marl* described by M. Puvis, a calcareous stratum of fossil shells underlies, at various depths, nearly the whole of this vast region: and though it has as yet been reached for use only where its out-croppings show at the surface, in future times, when the value of this improvement will be properly understood, this bed will be found and obtained by deep pits, almost in every neighborhood, and for the use of large spaces which are now considered destitute of, and entirely debarred from this manure.—Ed.

If this law of super-position exists, as is probable, it may be of great use in searching for marls; but observe, that the clay does not exclude the marl, except upon the spots where it is found; and that it is no proof of exclusion on the neighboring portions. The earthy strata of the surface have been greatly warped (*tourmentées*) and displaced; they are, therefore, even in the same district, far from occupying the same level, and from being regularly met with at the same depths; nevertheless, in this disorder, great as it doubtless is, the law of super-position which we have noticed does not cease to exist.

XXVI. Marl and lime are powerful agents of fertility in this kind of soil; but for both, and particularly for lime, it is necessary that the soil should be drained, or they must be applied to it in quantities resembling those of the English. With this condition of the soils being invigorated [by draining,] these two agents have already changed the face of extensive districts, which have been doubled by their means in wealth and population. An age ago, Norfolk, now a county of classic agriculture, was covered with heath; it is marl which has rendered it capable of bearing that succession of crops which makes it rival the most favored soils in fertiliy. One-third perhaps of the cultivated soil of England and Scotland has received, and still continues to receive, from lime, an impulse of fertility which raises the mean product of their fields to, at least, a half more than the same soil produces in France. Marl and lime, in Germany, have changed the aspect of whole provinces. Italy, by lime, has improved the culture of large wet *plateaux*. America renews by lime the exhausted fertility of vast plains, from which cultivation had demanded too much without returning to them a sufficiency of manure.

In France, La Puisaye in Yonne, has been trebled in value by marl: half the territory of the Department of the North owes its classic cultivation to marl and lime; many cantons of Normandy, the *Arrondissement* of Bernay, the environs of Lisieux, seek for marl at a depth of 200 feet; and finally in Sologne the use of marl has already improved great extents, but unfortunately it is more rarely found there than in other places.

Lime in the three Departments of Normandy has produced effects more numerous, more extended, but yet more recent than marl; a mine of coal (*houille*) of middling quality, worked during the last few years, there furnishes fuel for a great number of lime-kilns, three-fourths of the product of which are employed in agriculture. La Sarthe, Maine-et-Loire, which have employed lime for less than forty years, see their agriculture enriched in proportion as its use is extended.

The Department of Landes, with its barren sands, is covered with harvests by the application of lime to its soil: there is not perhaps an argilo-silicious plateau, in France, on which trials of marl and lime have not been made with success. We are far, it is true, from a commencement of experiments in their use on a large scale, but it is already a great point to have begun.

Nevertheless, as it appears, scarcely a fourth part of the argilo-silicious soil can have been improved by either of the means; if they were extended to the other three-fourths, it is not believed that there is any exaggeration in saying that there might result an increase of an eighth in the whole production of the French territory; an immense result, doubtless, and which would not be the only one; for a multitude of observations and arguments, as well as the actual healthiness of the lands where lime and marl have been largely used, should induce a belief that on this soil, improved by the calcareous principle, the salubrity which it wants would re-appear with the fertility.

XXVII. When marl and lime are wanting, or are at too great a distance, or too dear, their place may be supplied, and, on this soil which requires to be stimulated, an impulse of fertility may be given analogous to that produced by the calcareous agents. Paring and burning is a resource always certain for these soils; there is then a production of lime in the calcined vegetable particles. The vegetable powers produce potash and lime even in soils which appear to contain none; paring and burning brings into play these active principles of vegetation, which although in small proportions, exercise all their influence on the soil; and moreover the clay undergoes a modification which seems to produce upon the soil an effect similar to that of lime, and, like it, to develope, in a high degree, the faculty of imbibing from the atmosphere the elements of the growing plants.

ANALYSES AND QUALITIES OF MAGNESIAN SOILS.

By M. Puvis.

Translated for the Farmers' Register, from the *Annales de l'Agriculture Francaise.*

[The following extract is taken from the *Excursion Agnonomique en Gatinais*, of M. Puvis, his publication which next succeeded the foregoing article, and part of which is suited to follow in connexion. We shall present such parts as may throw light on the other communications of this writer, or otherwise, may seem likely to furnish agricultural instruction.

This part is selected as presenting specimens of a new class of soils, those containing magnesia—and to which ingredient, the author attributes their sterility. The facts presented are novel, (at least to us,) and also interesting: but the author's deductions from these facts, we dissent from altogether. Our views, in contradiction to our author's, will be postponed until his opinions have been presented.]

Plateau of Gatinais.

At some distance from Paris, when we leave the valley of the Seine, after having ascended a hill of considerable elevation, we find on the summit the silicio-argillaceous plateau; a great part of the forest of Fontainebleau is situated upon it, as is that of Montargis; this plateau separates the basin of the Yonne from that of the Seine. Silex prevails there in the state of sand; these sands serve as materials for the brown free-stones (*aux grés á cement calcaire et á cement siliceux,*) which are met with in only one part of the plateau; but when the free-stone is wanting, there is always found a great number of flints, which by their form and covering greatly resemble those belonging to chalk, which are found so abundantly in the basin of the Seine as far as the coasts of the sea. Chalk is found on the surface in many places below Pa-

ris; but above, it is most frequently covered with many other strata which keep it from the surface; and nevertheless, flints are very numerous in the soil of the plateau. In the same manner, in those of Dombes and Bresse we find the rolled pebbles of the Rhone, so numerous in all the formations of the basin; so the argilo-silicious plateaux almost always contain fragments peculiar to the formation of the basins which they overlook.

The fragments of the lower parts of the basin which are found in the argilo-siliceous alluvion of the plateau, would prove, if that had not been already established, that this formation is the most recent, that it was general, and that it took its elements even from the bottoms of the basin, and that it covered these bottoms as well as the high plains, or ridge land.

The Estate of Barres.

At some leagues from Montargis, beyond Nogent, we reach Barres, the property of M. Vilmorin.

This property, which he purchased thirteen years ago, contains 600 *hectares* (1,200 arpents.) His agricultural experiments, his desire to undertake great improvements, were too much confined in the neighborhood of Paris. To be successful on a soil of good quality, was not enough for his activity and his desire to be useful; he therefore made a purchase here on a soil of little fertility, and in his hands, this property has become quite an experimental farm. It could not have been better chosen for this purpose, because the land is composed of the two kinds of soil which form the district.

The property is divided into two parts by a small valley, containing 50 arpents of pasture, meadow and marsh, which are divided between the two domains; the eastern part belongs to the calcareous plain which unites with the calcareous plains of Yonne, without, however, being of the same nature as they: it composes two thirds of the property, that is, 800 arpents. The western part, which is more elevated than the eastern, belongs to the argilo-silicious plateau of the Gatinais; of the 350* arpents which compose it, 150 are sloping, and form the passage from the plateau to the valley. These 150 arpents partake of the two natures of soil; they are of good quality. The remainder, 200 arpents, belong entirely to the plateau, and are composed of sandy sub-soil mixed with angular flints of chalk.

This property offers greater resources in forage than most of the neighboring estates: besides the meadows of the valley, just spoken of, it has some of considerable extent on the Vernisson, a brook which waters the country.

I. The calcareous soil of the plain rests sometimes on a white, granulated marl, which is easily crumbled, and sometimes on a hard rock, which resists the atmospheric influences; it seems to make an exception among those of its class and appearance; its exterior characters would cause it to be esteemed fertile in a great part of its extent; it shows a sufficient stiffness, a dark color which announces a sufficiently strong proportion of mould, and often even the chestnut color, the ordinary indication of a good soil.

It is especially in spring crops that this soil shows its inferiority; oats, barley, and spring vetches come up well enough after sowing, but they are without strength at the time of heading. Clover, lucerne, and sainfoin, take well when sown in the spring; at harvest, the cereal plants cover them; they are vigorous enough, and preserve a good appearance even during autumn and winter; but when the time for shooting arrives, they put up only a small number of stalks.

When this soil remains uncultivated, it is badly covered with turf, produces thistles, euphorbia, and other plants of no use or advantage to the cattle that run upon it. It suffers from wetness. Sheep upon it take the rot; but it suffers still more from drought, which seems to render the stalks of plants stationary upon the soil.

II. The calcareous plateau of which we speak here is very extensive: it reaches from Montargis to beyond Barres, more than 10 leagues in length.

This kind of soil appears to be peculiar to this part of the basin of the Seine; the neighboring calcareous soils which appertain to the basin of the Yonne, present entirely different characteristics; they are dry, it is true, but with a vegetable stratum, they become covered with wild leguminous plants, easily produce clovers, sainfoin, lucerne, and in wet springs, spring crops succeed upon them.

These soils have then something peculiar in their nature which makes them a troublesome exception in the class to which by their composition they naturally belong: they present an agricultural question of great importance to study, and almost new, and they are applicable to sufficiently great extents of soil, since they occupy more than ten leagues in length.

The analyses made of them by M. Henry, at the request of M. Vilmorin, are very interesting, and are as follows:

No. 1. A coarse gray land, the earth of the surface composing at least three fourths of the ploughed soil of the plain.

10 *grammes* of this earth gave:

Silex,		2.45
Alumine,		0.35
Carbonate of lime,		3.85
Sub-carbonate of magnesia,		0.23
Per oxide of iron,		0.41
Humus,	Soluble, 0.12 / Insoluble, 1.70	1.82
Water,		0.58
Loss,		0.31
		10.00

The 18 per cent of *humus*, soluble and insoluble, which this analysis gave, may cause a suspicion that the sample furnished contained more of it than an average of the soil. The proportion of *humus* would be quite extraordinary, since lands the most fertile contain scarcely 10 per cent: and there are hardly any except marsh or alluvial lands which contain it in that proportion; it is nevertheless established by this analysis that this soil contains a great proportion of *humus*, especially of insoluble *humus*.

No. 2. Represents nearly a fourth part of the extent—the portions where the vegetable stratum is very thin, where it is not ploughed on account of its deficiency in fertility, and is used as a sheep pasture.

*In the original, this is misprinted as 250.—Tr.

10 *Grammes* gave:	
Silex - - -	1.80
Alumina - - -	0.20
Carbonate of lime - -	6.90
Sub-carbonate of magnesia -	0.47
Oxide of iron - -	0.27
*Oxide de magnesie** [manganese?] a trace - -	0.00
Water - - -	0.20
Humus, soluble - -	0.05
Loss, and charcoal of insoluble humus - -	0.11
	10.00

This earth, the least fertile of all those analyzed, contains twice as much carbonate of lime and of magnesia as the former; the color also is whiter. It appears to receive its change of color from the *detritus* (or broken down fragments) of the friable rock on which it is based; its composition is almost identical with that of the sub-soil No. 4, of which we shall give the analysis below.

No. 3. Sandy earth of the calcareous plain belonging to those portions of the plain, which, in the revolution that carried off the silicio-argilaceous stratum, preserved a part of it now mixed with the soil of the plain.

10 grammes of this earth contain:	
Silex - - - - - -	7.90
Alumine - - - -	0.67
Sub-carbonate of lime (represented by *chlorure*, 0.18) -	0.16
Sub-carbonate of magnesia -	0.02
Oxide of iron - -	0.47
*Oxide de magnesie** [manganese?] - - - -	0.03
Humus, soluble - - -	0.15
Water - - - -	0.35
Loss and charcoal of insoluble Humus - - - -	0.25
	10.00

This earth presents a great difference in composition from the preceding, since it contains 80 per cent of silex and scarcely 16 thousandths of carbonate of lime, and 2 thousandths of carbonate of magnesia. Yet its properties, its productions and its defects, are nearly the same as those of the preceding numbers. On the other hand, it would seem by its composition to be almost confounded with the sandy sub-soils of the plateau lying on the other side of the valley; but it produces neither heath, broom, nor sheep sorrel, &c.; plants characterizing these sands—and it agrees, as to cultivation; with Nos. 1, and 2, and like them, spontaneously produces euphorblia, thistles and other plants useless to cattle. It possesses then those common properties of an active agent which must be common to both, which makes them a distinct class; and this agent can be nothing else than the mixture, or perhaps combination of the carbonates of lime and magnesia.

These two principles, therefore, have a very great effect upon vegetation, since 16 thousandths of carbonate of lime joined to 2 thousandths of carbonate of magnesia are sufficient to change entirely the nature and products of the soil. But let us pursue our analyses before making a deduction of all their consequences.

No. 4. Sub-soil of the plain. Its color is reddish, as is that of many calcareous soils of good quality; but having been neither affected nor modified by the waters of the last revolution, in consequence of the shelter given it by the upper stratum; and not having been exposed to the atmospheric influences, it may be regarded as the type of the deposite which forms the soil of the plain, the deposite anterior to the silicio-argilaceous formation.

10 Grammes of the sub-soil of the plain gave:	
Silex - - - - -	0.39
Alumine - - - -	1.27
Carbonate of lime (represented by *chlorure*, 8.20) -	7.41
Carbonate of magnesia - -	0.41
Oxide of iron - - -	0.31
Oxide of magnesia - -	0.00
Water - - - - -	0.06
Humus, soluble - - -	0.05
Loss - - - - -	0.10
	10.00

This soil is a species of marl which contains 74 per cent of carbonate of lime, 4 of magnesia and 12 per cent of alumine: its composition is quite similar to that of the analysed soils of the plain.

III. These analyses may afford us important inferences.

These soils evidently make, as we have seen, a distinct class of the silicious soils. Their properties seem to differ at least as much from those of calcareous soils, properly so called, which produced spontaneously the small species of clover, on which leguminous plants of different species succeed easily, and manures almost always secure good crops. It is not then to the carbonate of lime that they owe their inferiority: its action, on the contrary seems, to be nullified, since the characteristic properties of calcareous soils appear no longer to exist in these. Nor is it more to the silex, the alumine, nor the oxide of iron, which are found in abundance in all good soils, that this difference can be attributed. Then, of all their constituents, there remains only the magnesia to which can be owing the characters which distinguish them from their analogous soils.

It has been already fully admitted in principle that magnesia is unfavorable to vegetation. The English chemist Tennant formed this conclusion from the analysis of a lime which struck with sterility all the soils to which it was applied. In America the use of a magnesian lime quickly wore out (*fatigué*) the soil; and Davy has admitted it as a truth. Some trials on a small scale have shown me that while in a calcareous soil, beans, when sown, sprouted soon, and came up vigorously, in the same soil modified by an addition of magnesia, germination was retardeded, and the stalks especially had only a feeble and tardy growth: Yet Thaër call into question the soil being made steril by magnesia; and opposes to the conclusions of Tennant, that Einhoff has analyzed a very fertilizing marl which contained 20 per cent of magnesia: and farther, it results from a careful analysis, that the mud of the Nile, which we know to be so fertile, contains a large proportion of magnesia. From these last facts it may be concluded

* So in the original.—Ed.

that the magnesian mixture in the soil may indeed, under certain conditions yet unknown, not be injurious to fertility: but there still remain multiplied facts, and the results of observations, of which our whole plain presents us with a new and great example, that many magnesian soils are unproductive.

But how does magnesia occasion barrenness in a soil? This problem is doubtless of difficult solution, but very important, since it seems probable that if we knew the causes which render magnesia unproductive, it would perhaps be possible to remedy them; we shall attempt to point out some *data* which perhaps may indicate the course.

And first we will remark that the magnesian mixture takes from the soil all its characteristics of calcareous soil, deprives it of all the advantages which always accompany the unadulterated mixture of the calcareous principle, and gives it a character peculiar to itself, which distinguishes it whether by its mode of acting on vegetation, or by the vegetables which it spontaneously produces, to the exclusion of those produced by the calcareous soil.

Still farther, it would seem, that magnesia takes from the carbonate of lime the property which eminently distinguishes lime and all its compounds; that of rendering *humus* soluble, and that it tends on the contrary to render *humus* insoluble, in proportion as it is accumulated in the soil by cultivation. In fact, the great proportion of insoluble *humus*, which the analyses have found in the soil which composes three-fourths of the cultivated plain, although a part might have been owing to an accident, could not proceed from spontaneous vegetation in this soil which is almost always under the plough, and which produces few plants. It proceeds then from cultivation: but cultivation does not furnish insoluble *humus;* the *humus* of the manures, then, have passed into this state in the soil. Now, it is not the lime, the action of which consists in rendering *humus* soluble, that can have produced a contrary effect; neither is it the silex nor alumine to which it is attributable; it must therefore be charged to the magnesia alone, and to this circumstance we may ascribe the unproductiveness of magnesian soils, in which manures, instead of benefiting the plants cultivated on the soil, pass into the state of insoluble *humus*.

The carbonate of magnesia has, besides, the property of retaining more water than all the other earthy combinations. According to the experiments of Schubler of Hoffwyl, it receives and retains four and a half times its weight. It may be possible that it communicates to the soil in which it is found, the property of retaining a quantity of water, which at first would be injurious to vegetation. This would explain the cause of the rot among sheep on this soil; but this water, after having injured vegetation, would not continue in the soil, for it suffers much from drought in the spring.

In this state of affairs, and in a question so important, on which doubts are accumulated, and facts and opinions are arrayed in opposition, it is a great and noble agricultural problem, that the proprietor has proposed for himself to subdue this rebellious soil and force it to yield good crops; we shall see hereafter that this object has been, in a great measure, obtained.

IV. After this long discussion on the magnesian soil of the plain, we come to the soil of the *plateau:* this kind of soil composes a great part of the *arrondissement* of Montargis, especially in the south and south-east portion; it covers besides almost the whole extent of the *arrondissement* of Gien on this side and beyond the Loire. This soil has received the name of *terre de Sologne*; the only differences which characterize the parts sloping towards the Seine and those which slope to the Loire, are the chalk flints in the basin of the Seine and the fragments of different varieties of silicious rocks in the portion of the *plateau* which slopes to the Loire.

The soil of the *plateau* of Barres offers every where a pure clayey sand, which contains in great quantity the chalk flints of the basin of the Seine, and varies little. Yet it is dry or wet according to the sub-soil on which it rests; when it is based immediately on the calcareous rock of the plain it is dry; and it becomes wet when its sub-soil is the reddish silicio-argilaceous stratum which does not allow the water to pass through, and consequently preserves the moisture of the surface.

This soil, compared to that of the plain, is not of difficult cultivation. Rye, potatoes, and buckwheat, grow well enough upon it; with manures, artificial meadows succeed; and trees of every kind, leafy *(feuillus)* and resinous, shoot up vigorously. On the whole, this portion of soil which touches the calcareous *plateau*, on which besides it rests, is superior in quality to the parts of the *plateau* which are more distant from it. It is even of more easy cultivation, and offers especially more resources than the magnesian soil; nevertheless, it contains no calcareous parts, heath, broom, and wild sorrel, which every calcareous mixture puts to flight, are met with on this soil in all parts of the 200 arpents of it which are left untilled.

V. The rest of the soil, under the plough, of which the property is composed, presents a gentle slope, on which the owner's house is situated. This slope forms the passage from the *plateau* to the plain, going along the valley; it offers 150 arpents of pretty good soil, suitable for all productions, for wheat, artificial grasses, trees, and especially for oaks; this soil is due to a mixture of the soil of the *plateau* and of the plain, but the mixture is not uniform.

VI. Lastly, it remains for us to speak of the little valley which separates the two parts of the property.

This narrow valley receives the waters of the plain and the *plateau;* it contains a great number of springs, which are doubtless the filtered waters of the two *plateaux* which have no visible springs. It is very remarkable that the springs come almost all of them from the side of the calcareous plain, the silicio-argilaceous plateau with its *impermeable* sub-soil, has scarcely admitted any filtration, so its side furnishes few or no springs in the valley.

A great part of the bottom of the basin is marshy, requires draining and seems to us very susceptible of being drained; one part is in pretty good pasture, another in tolerable meadows, and the rest in marsh, which is mown for litter.

The calcareous rock shows itself from time to time at the bottom of the valley. The upper stratum of the soil, belongs rather to the magnesian soil of the plain than to the silicious soil of the *plateau*. It is firm in all the parts which the interior waters have not diluted. Works judiciously

made in the marsh have commenced its draining, the results obtained and a sufficiently great slope, promise, as we shall see hereafter, success to the undertaking. Vegetation in this valley is active, the trees are fine, and if the magnesian principle, as is probable, occurs there, it does not seem to injure vegetation; in this inundated soil, some principles probably exist which neutralize the destructive effect of the magnesia. * * *

REMARKS.

It seems a singular and illegitimate conclusion of the author, that the sterility of the soil of "the plain" is caused by the small quantity of carbonate of magnesia contained. It would have been much more plausible, if the very large proportion of carbonate of lime contained had been considered as the true evil. The soils giving the analyses 1 and 2, are stated to be specimens of the whole calcareous and magnesian plain—and No. 4 shows the sub-soil common to both, and to the whole plain. In these two varieties of the same general kind of soil, the proportion of carbonate of lime is 38 per cent. in the first, and in the second, 69 per cent.—and the sub-soil of both, (No. 4,) has 74 per cent. Surely these large proportions of carbonate of lime, are sufficient to account for sterility, after the continuance of exhausting and bad tillage for time immemorial, without looking for that cause in the presence of carbonate of magnesia, which these same three specimens contain respectively in the very small proportions of 23, 47, and 41 thousandths—or less than the half of 1 per cent. We do not believe that this earth (in much larger proportions,) is injurious to soils but infer the reverse, from the great similarity of its chemical qualities to those of carbonate of lime—and from some of the richest soils in the world containing carbonate of magnesia. Thus M. Puvis himself states that it is in the soil of the rich valley of the Nile—and we have found it in the celebrated alluvial soil of the Red River. The authorities brought to sustain the position that the magnesian ingredient is injurious to fertility, if examined, are worth as little as the reasoning. Tennant, it is true, attributes injurious effects to the magnesia contained in certain limestones; but it is to magnesia brought to its *caustic state*, by the burning of the limestone, and so applied to the soil. This may well be the case, and all the injurious effects of such manure, referred to by our author, may be true, and yet the mild *carbonate of magnesia*, as it exists naturally in soil, may be either harmless or beneficial. Still less does Davy's view sustain this opinion of M. Puvis. That great agricultural chemist quotes Tennant's discovery and statement, but without seeming to concur entirely in the asserted ill effects of even caustic magnesia—and he certainly contradicts the notion that a natural and small proportion of the carbonate is injurious, by referring to the valuable qualities of the Lizard Downs, which have that rare ingredient.

But putting aside M. Puvis' deductions, the facts as to the presence of magnesia, and the prodigious amount of calcareous earth in this poor plain, are sufficiently worth attention. We cannot, however, presume to reason with regard to facts which are so concisely and imperfectly presented, or to explain away difficulties which oppose any general and uniform deduction. But we will venture to hint our opinion, that these highly calcareous plains of France, were at some far remote period immensely rich *prairies* like those of Alabama and Arkansas: and that the latter, if exposed to a similar long course of exhausting tillage, will hereafter be as poor, and as difficult to be improved, as these calcareous plains of France, or the chalk *downs* of England.

From the Arcana of Science.

PRICKLY COMFREY—A NEW SPECIES OF FOOD FOR CATTTE

Symphytum Asperrimum, a hardy perennial of gigantic growth, introduced from Caucasus, as an ornamental plant in 1801, by Messrs. Loddiges, of Hackney, as specified in Curtis's *Botanical Magazine*, where it is figured, No. 929. Horses, cows, sheep, pigs, and geese may be fed with it; and as it is of wonderful growth, and, may be cut successively from April to October, it may be cultivated to great advantage. For horses, to be put in the racks, spread on pastures, or the green stalks to be cut with chaff, it will be found most useful. Two out of three will take it at once, the others will soon follow, and when once the taste is acquired, they will never leave it. Cows do not take it at first so freely as the horse, but soon take it, and are eager for it. For sheep or lambs it is very good; they will take it freely, the latter before they are a month old. It is a very early plant, and immediately follows the turnips. The first crop of leaves to be fed off before the flowering stalks rise, care being taken not to feed too hard, so as to damage the crowns of the plants. Spread on pastures, put in racks or folds on fallows, it will be found of great service. For pigs it is very useful; they eat it freely and do well. Geese will eat it, as soon as hatched. It will grow in all soils and situations, superior to any other plant, and may be planted by the sides of ditches, in any waste corner, fields, orchards, gardens, &c., where only useless rubbish grows. The only expense is, the purchase of a few in the first instance, as it may be increased to any quantity, and, once established, will last for ever. I know some that have stood more than twenty years, and are as full of vigor as they have ever been. It is now ready for cutting (March 31st). I have cut it when more than seven feet high, and as thick as it could stand on the ground. I once cut and weighed one square rood; the average was seventeen tons, three cwt. per acre. I have no doubt but that in the course of the year the produce would have been thirty tons. I cannot say what effect continual cutting may have on this plant, or on the land, for many years together; but as far as I have experienced, it does not weaken the plant. I have cut it three times in one year, and found it equally strong the following spring. The proper distance for planting it is from two to five feet square, according to the quality of the land. It may be planted at any time of the year, but, like other herbaceous plants, is best when in a growing state. —See a letter to Lord Farnborough, signed Dr. Grant, in the *Northampton Herald and General Advertiser*, Saturday, October 10, 1835.

From the Baltimore American.

CULTURE OF THE TEA PLANT IN OHIO.

The geographical position of China and the United States is similar, both being situated on the eastern side of their respective continents, and lying between nearly the same latitudes.—Hence there is, it is said, great resemblance and correspondence between them in climate. Our attention is called to these circumstances at the present moment by seeing the annexed account of the successful culture of the tea plant in this country. The plant flourishes in China as high north as the fortieth degree of latitude, although the other kinds grow in the more southern provinces of China. Unsuccessful attempts have been made in various parts of the world to rear the tea plant, but this we believe is the first in our own country. We see no cause why the plant should not flourish in this climate, and a knowledge of the art of curing it can be easily attained.

"Mr. John Platt of Marietta, Ohio, advertises in a paper of that place, that he has succeeded in cultivating the genuine Tea Plant of China. He has, he says, raised the plant for ten years past at Marietta, and after a series of expensive experiments has been fully successful in discovering the art of drying and manufacturing the leaves into tea of a quality quite equal to imported Young Hyson. He offers gratuitously to furnish fresh seed of the last year's growth to any gentleman desirous of pursuing the cultivation."

From the Dublin Journal of Med. and Chem. Science.

PRESERVATION OF LEECHES.

A. Voget, in a notice inserted in the *Pharmaceutische Zeitung*, observes, that he has been in the habit of adding a small quantity of powdered crab's eyes, to the water in which he keeps leeches. This powder of course sinks, forming in the bottom of the vessel a thin stratum, in which the leeches seem to take the greatest pleasure, creeping about on it, and thus cleansing the surface of their skins, and getting rid of the mucous threads and flocculi, with which they soon become encumbered, when in a state of captivity.

Cavaillon, Chevallier, and Moreau de Jones, have all borne witness to the good effect of mixing *charcoal* with the water in which leeches are transported from one distant place to another. In cases where it is necessary to carry them during a long sea voyage, the inside of the vessel should be well *charred*, and some very finely powdered charcoal should be added to the water. Cavaillon prefers for this purpose *animal charcoal*, as it possesses much stronger antiseptic powers than the vegetable. It was by means of charring the casks and adding some charcoal to the water, that the French succeeded in conveying, in health and vigor, a considerable number of the fish called gorana, from the isle of Bourbon to Martinique.

Doctor Kluge, of the Charite, in Berlin, made some interesting experiments, on the best means of preserving leeches.—From his researches, Dr. Heyfelder has been led to recommend a mixture of three parts of rectified spirits, four parts wine vinegar, and twenty-four parts water. The leeches are to be placed in this mixture, and are to be left in it a little less than five minutes, after which they are to be washed with fresh river water, and to be put into a vessel for keeping. Leeches that have been used are likewise served in this manner.

From Jameson's Journal.

RESISTANCE ON RAIL ROADS.

At the late meeting of the British Association, Dr. Lardner made the following observations on rail roads. He stated that every road offers a sensible resistance to traction, but this on a rail road is less, because the surface is more uniform. The resistance on a rail road to the power of traction is always the same, as the resistence produced by ascending an acclivity, rising one foot in 250; that is, supposing the rail road to be level. Suppose a rail road rising 1 foot in 250, resistance to traction then proceeds from two causes,—the resistance on the level, as already explained, and the resistance offered from the actual declivity. The resistance to be overcome on the level is equivalent to nine pounds per ton; and on the road ascending 1 foot in 250, it would be eighteen pounds per ton; and thus it is seen that, in the latter case, the drawing power must exert twice the force necessary on the level. If the road rose 2 feet in 250, the drawing force would be twenty-seven pounds to the ton. This view of the subject is confined to ascents, but it should not be forgotten, that when a rail road is worked, the transit is from one end to the other. It is necessary, in estimating the merits of rail roads, to consider their action downwards as well as upwards. In coming down a steep no force is required to impel an engine, and the gravity restores that force in going down which it has robbed from it in the ascent. You have to provide in an ascent of 1 foot in 250, for a resistance of eighteen pounds to a ton, but in descending, no force is required. If it was desired, to strike an average between the ascent and descent, the road would present a surface which would be equivalent to a level. This point, respecting ascent and descent, struck the House of Lords, before which he gave his opinion, as a paradox, but it was one only in sound and not in reality. Dr. Lardner remarked, that these observations referred to ascents not more steep than 1 foot in 250; but supposing the rise to be 3 feet in 250, and where the strain would be, consequently, thirty-six pounds in each ton, would gravity give this back in the descent? It was true that no power was required in descending, but while only nine pounds were gained in the descent, twenty-seven pounds were lost in the ascent. Besides, the loss of power, there was also the danger resulting from the too great velocity occasioned by sudden descents. In one of the lines of rail way, for which a bill had been applied to the House of Lords, there was a slope of 1 foot in 106, in a descent of two miles and a half, and the velocity given to an engine on arriving at the foot of the slope could not amount to less than seventy miles an hour. To mitigate defects arising from these abrupt descents, breaks were applied, but not always with success. The break is a piece of wood, pressed against the tire of the wheel by a level, and if it acts with full effect it ought to prevent acceleration. He had seen several cases in which it had totally failed, and one instance which occured, he would detail. At one of the slopes between Manchester and Liverpool, he was descending

with a loaded train of 150 tons. The operative engineer, whether through a desire of displaying the engine's movements, or through neglect, forgot to apply the break at the commencement of the slope; when half-way down, the velocity became so great, that he requested the breaks to be applied, but on doing so, they were instantly burned. The train went down at a tremendous speed, although the supply of steam had been cut off. When the train had been stopped, it was fouud that the wheels of one of the wagons which revolved with the axis, had been broken, and yet, notwithstanding this accidental drag, the speed amounted to at least fifty miles. It was objectionable to have any slope exceeding 1 in 250, for when the excessive natural powers of gravitation were resorted to, control over its movements was impossible. The conclusion to be arrived at, although it appears paradoxical, is, that you may construct two rail roads, say of 100 miles in length, one level, the other going over mountains, and yet the two rail roads may be worked by the same mechanical power. Suppose in the one you ascend 1 in 250, and descend in the same ratio, a pull of eighteen pounds to the ton is required only fifty miles, and on the other half you descend by inertion. On the level road, a pull of nine pounds to the ton is required, from the entire distance of miles, and thus the extent of exertion is equalized. It was not, however; to be forgotten, that they should have a regard to the power used. If the power to be used was that of animals, then it might happen that the hilly road would be better than the level; for nothing was better understood than that a dead and unvarying pull upon the same set of muscles, would have the effect of causing the labour to be more severe, while a varying pull would alternately give quiescence and exercise to the muscles. If the line was so disposed as to throw the whole ascent in one spot, the advantage would be gained of having the rest of the road nearly level. But the cost of attaining this advantage should not be forgotten. Steeps of this description required an increased power, and the engines capable of working on the general line of road would not be capable of exerting an increased force. There were only two ways of ascending sudden ascents, one by the agency of an additional engine, and the other by having the whole train pulled up by means of a rope. The additional engine would occasion much additional expense, for the supply of them would always be preserved, and the men should be paid their wages whether wanted or not. The use of the rope would occasion an enormous waste of power; and he mentioned the instance of a place, where on ascent of 1 foot in 106 occurred. The rope was five miles long, and its weight was 60,000 pounds. Dr. Lardner next referred to one point on which he seemed to consider that engines generally were at variance with what was correct. He contended, that the heat of the fire is directly proportional to the quantity of the steam allowed to escape in a definite time into the flue, and consequently that half the number of blasts of steam projected into the chimney in an engine going up a hill, would have the same effect in exciting the fire as double the number of blasts of half the condensation, when the engine was running on a level plane.

From the Baltimore American.

TRADE OF THE UNITED STATES

The annual statement of the Commerce and Navigation of the United States for the year ending 30th September, 1835, lately laid before Congress, presents the following general results. They are derived from that document by the Washington correspondent of the New York Journal of Commerce.

The imports during the year, (ending 30th Sept. last,) amounted, in value, to $149,895,742, of which there was imported in American vessels $135,288,865, and in foreign vessels $14,606,877. The exports during the same year amounted to $121,693,577, of which $101,189,082 were of domestic, and $20,504,495 of foreign articles. Of the domestic articles, $79,022,746 were exported in American vessels, and $22,166,336 in foreign vessels. Of the foreign articles, $15,112,445 were exported in American vessels, and $5,392,050 in foreign vessels. Of American shipping 1,352,653 tons entered, and 1,400,517 cleared from the ports of the United States. Of foreign shipping 641, 310 tons entered, and 630,824 cleared.

The greatest imports in any previous year, were in 1816, at the close of the war, when they amounted to $147,103,000—being $2,792,742 less than last year: and the greatest exports in 1807, when they amounted to $108,843,150, or $12,850,427 less than last year. Of the exports in 1807, only $48,699,592 consisted of domestic articles, whereas last year the domestic exports amounted to $101,189,082. [The year in every case unless otherwise specified, ends 30th of September.] In 1834 the imports amounted to $126,521,332, being $23,374,410 less than in 1835; and the domestic exports to $81,024,162 or $20,164,920 less than 1835.

The tonnage which entered the ports of the United States in the year ending 30th Sept. 1835, was 1,993,963 tons, as stated above, being a greater amount by 351,241 than entered during the previous year. Of this increase, 277,983 tons were American shipping, and 73,258 tons foreign shipping. Showing a comparative gain in favor of American. The same remarks, with some slight variations, are applicable to clearances.

The statement of actual tonnage owned in the United States, indicates a corresponding increase. The returns for the year ending December 1834, show a greater amount than in any former year.

From the New England Farmer.

PREMIUM ON DRAINING AND CULTIVATING SWAMPY LAND.

At the late annual meeting of the Agricultural Society, Mr. William Clark, Jr. of Northampton, presented his claim, and obtained the Society's highest premium, offered "on the greatest quantity of land reclaimed and crops therefrom, accompanied with a written description of the management, condition and worth of the land, before and since reclaimed." The Executive Committee have the privilege of presenting a detailed account thereof, and would be very happy for the opportunity of exhibiting many other similar experiments made by our enterprising farmers. Mr. Clark also obtained the Society's highest premi-

um for the greatest quantity of Indian corn raised the past year upon another tract of land.

To the Executive Committee of the Hampshire, Hampden and Franklin Agricultural Society:

Gentlemen—In the spring of 1834, I commenced ploughing for a crop of corn, a field of about fourteen acres. In various parts of the field were swales, wet, springy places and swamp holes, some parts of which were covered with water most of the season, some with moss and small bushes, and others with sedge and course grass, amounting in all to four or five acres. The best part of this wet land was mown in 1833, and gave of poor hay but little more than enough to pay the expense of gathering; the remainder was entirely unproductive and probably ever had been.

As it was desirable that these places should be something more than mere nuisances, and if possible, the whole field wear the appearance of civilization, it became a question for consideration, whether it could be done in such a manner as that the produce would pay the expense. After a careful view of the ground, it was thought that the plough would be the readiest and least expensive instrument for draining off the water as well as subduing the wild grass and shrubs.

A long swale running nearly through the lot with a moderate descent, gave a good opportunity to drain with the plough, not only the water that was oozing out over its surface, but also that from the springs and wet lands on either side.

The largest basin, or swamp hole, amounting to about half an acre, including the belt of small bushes and balk around it, and situated near the highest part of the lot, was laid dry by an under or covered drain of about six rods in length, cut through the rim of the basin, previous to ploughing; the other parts were drained of the surface water without the use of the spade, by drawing the first furrow, when striking out the lands or ridges, at such places as would cut off the springs, and in such directions as would give sufficient fall to the water, and lead it into the main furrow in the long swale. Considerable care was necessary to strike out the ridges, so that when the ploughing was finished, the furrows should not only have a good descent, but lead off the water without further labor in opening communications from one to the other.

After the superabundance of water was thus taken off, and the ground became so solid that it could be ploughed, which was in a day or two, the whole was turned over; care being taken that none of the former growth should be left on the surface, but all turned under to the depth of five or six inches; if possible, without bringing up much of the poor subsoil. And to drain the ground yet more perfectly after it was ploughed, the furrows were deepened by running the plough through them a second time, and the loose earth hauled out upon the ridges. After it became sufficiently dry to work, it was rolled, and about 20 cart buck loads to the acre of horse manure, was spread from the cart over the surface and harrowed in.

The other parts of the field having been treated in the same manner, except the draining, the whole was planted with corn, in rows without regard to furrows or drains, except not planting in them. When harrowing the corn, particular care was taken not to disturb the sod, and at each time of hoeing the ground was kept as level as possible, except the water furrows or drains were cleared of the earth that the harrow in crossing them had hauled in, and a free passage for the water at all times maintained. At the last time of hoeing, the whole field was sown with grass seed, and also with about half a bushel of plaster to the acre. The whole crop of corn, as ascertained by the admeasurement of the ears, was about thirty bushels of shelled corn per acre, and had probably suffered a diminution of about twenty-five per cent. from the severity of the drought at the time the corn was filling out.

In the wet, or those parts of the field more particularly under consideration, the crop of corn on an average was light, perhaps not over two thirds the average of the whole field, or twenty bushels to the acre, although in some places where the draining was the most perfect and took effect early in the season, it was very good.

The grass seed took well, and after the corn and stalks were cleared off, the field contrasted finely with its former appearance. The brown and sere plain, the mossy bog, and heathy knoll, were clothed in green. No cattle were allowed to go on it, nor was it fed at all, except a little by trespass.

In the spring of 1835, after the ground was settled so as not to poach, it was rolled to re-set the grass roots that might be partially thrown out by the frost, crush the corn stubs, and level for the scythe. Having a preference for early cut clover, it was mown in June, part of that on the reclaimed land having begun to lodge, although the field in general was backward, not in full bloom, and according to common usage, not ready to cut. The reclaimed land suffered the least from the drought, and gave an average of about one and a half tons to the acre, while that of the whole field was about one ton. The hay was a fair mixture of clover, herdsgrass and redtop.

Immediately after the first crop was off, half a bushel of plaster was sown to the acre. The second crop was principally clover, and the reclaimed land at this cutting also gave much the best grass, probably an average of not less than two tons to the acre. The average of the whole field was something over one and a half tons, as ascertained by the actual weight of about twenty tons sold from the field. One of your committee went over the ground and viewed the crop at the last cutting. It is impossible to state precisely the expense of removing the stone and stumps, and that of ploughing, cultivating, and gathering the crops of the reclaimed land, or the value of its products separately, as the labor was performed in connexion with that of the whole field, and no separate account was kept with any given part of it.

I will, however, submit the following estimate, as being in my opinion not far from correct, taking the average of the reclaimed land, or that part of the field which before gave no valuable product.

One acre swamp.

1834.	Dr.	1834.	Cr.
To clearing for		By 20 bu. at 75c	$15

plough,	$3 00	Stalks,	1
To ploughing,	3 00		—
To 20 loads manure,	20 00		$16
To rolling, harrowing and clearing drains,	2 00		
To planting and cultivating corn,	6 00	1835.	
To seed corn, grass seed, and plaster,	2 50	By 3½ tons hay sold in the field at $10 per ton,	$35
To harvesting,	2 00		——
			$51
	$38 50		48
1835.			——
To rolling, clearing drains and plastering,	$1 50	Balance creditor,	$3
To cutting and making two crops hay at $4 the cut,	8 00		
	9 50		
	38 50		
			$48 00

The profit, thus far, it it may be called a profit, is small, but that the land is as thoroughly subdued and well fitted for future profit, as it would have been, under the usual three years' siege of plough and drag, and at very much less expense, I think will not be questioned. From the most worthless and barren, it has become the most valuable and productive part of the field, and the crops in two years, to say the least, have paid the expense of the improvement. The crop the coming year, other things being equal, will undoubtedly be as profitable as that of the last year, and probably valuable crops will be taken with little more than the expense of gathering for several years to come. And when it becomes necessary to turn under the present sod, it can be done at much less than half the expense of the former operation.

Respectfully, your most obd't serv't,

WILLIAM CLARK, Jr.

Northampton, March, 1836.

ON MIXING OTHER GRASSES WITH CLOVER, TO PREVENT ITS SALIVATING THE HORSES FED ON IT.

To the Editor of the Farmers' Register.

Perhaps the following hints on soiling horses with green clover, may be useful to "A Subscriber" in the last No. of the Register. That "clover has an inherent property which causes it sometimes to salivate," cannot be doubted; what that inherent property is, I am not sufficiently skilled in chemical knowledge to determine; but from experience, I am convinced its salivating property may be in a great measure if not altogether neutralized. Having had an opportunity when on the opposite shore of the Atlantic of seeing the practice of soiling with green clover, and the benefits resulting from it as practiced in Great Britain, where the majority of the farmers are in the constant habit of giving it to their working and other horses during the spring and summer months, not only without injury, but with great benefit to the teams so fed—from a very free and liberal use of green clover in that country, I never knew salivation caused to any serious extent, or for any length of time. In this country I have found, and I believe it is very generally admitted, that a very moderate use of green clover oftentimes bring on salivation to an alarming extent. What causes should operate to produce this difference in effect, I cannot probably satisfactorily explain. It is not improbable that a difference in climate might in some measure tend to produce a difference in effect; but from my own observations in the country above alluded to, (and under more than usually favorable circumstances for such observations,) and from my own experience in this country, I should almost unhesitatingly attribute our want of success in this mode of feeding or soiling our horses, to our nearly universal practice of giving clover to our teams in a pure or unmixed state, and too often immediately after being cut, and without the benefit of a partial curing. In Great Britain, it is generally considered that clover alone, either in a green or perfectly cured state, is an unhealthy article of food for horses; to remedy this, it is the common practice when clover is intended for green soiling or for hay, when sown to be mixed with a large proportion of the seeds of other less succulent grasses. For this purpose, the *lolium perenne*, or perennial rye-grass, is the grass generally, though not exclusively preferred, sown at the rate of about a bushel of grass seed to the gallon of clover seed. When intended for any length of time for pasture, different sorts of grasses are included in the mixture. The above named grass when in a green or growing state, contains nearly as much soluble or nutritive matter, and nearly double the quantity of insoluble matter or extract, that is contained in clover; and the probability is, that the greater quantity of the latter ingredient acts as a corrective to the salivating property of the clover. An instance occurred last season within my own knowledge, which goes far to support the above supposition. On a farm, where I had an opportunity of almost daily observation, it was found absolutely necessary to commence soiling the teams with green clover at a very early period of the season. The clover was pure or unmixed, and the consequence was, that the whole of the teams speedily became salivated to an alarming extent. Various supposed remedies were tried without any apparent good effect. After the horses got much reduced and had become extremely weak, they were, as a last recourse, turned out to pasture for an hour or two at night, on a piece of ground having a good cover of grass free from clover, partly mixed with timothy and tall meadow oat grass; and though in the meantime their racks were kept plentifully supplied with green clover, in two days salivation was entirely stopped. A wet spell shortly after occurred, when it was found inconvenient, or considered imprudent, to tend the horses for that spell after dark, and it was consequently for some nights discontinued, when salivation again returned, but was again immediately stopped on a return to pasture. A sprinkling of salt on green clover, is generally considered beneficial. Dry wheat straw (that which is sound and sweet,) freely mixed with clover used green for soiling, (such as in this section of country is generally used,) I have found attended with great benefit, and if properly attended to, would, in my opinion, founded on the present as well as former years'

experience, fully counteract the salivating property of the clover.

As "A Subscriber" remarks, I have found horses tired of, and sometimes altogether refuse pure clover hay; but I never knew such to be the case when properly mixed with other grasses. When clover is sown for the sole purpose of improving the soil, probably sowing it unmixed may be best; but when intended either for soiling or for hay, much and decided advantage would be derived from a free mixture of other grasses.

In Great Britain, the term clover hay is applied to all hay sown, when so much mixed as to contain from one third to one half of its entire bulk of other grasses, and in many cases, even more.

N. L.

Form the Horticultural Register.

FACTS IN REGARD TO THE GERMINATION OF SEEDS.

* * * * At one of their meetings, Count Sternberg offered some information on the sprouting and growth of grains of wheat which had been found in the cases of Egyptian mummies. The first attempt to vivify the wheat by previous immersion in weak acid failed, owing, as it appeared, to great age having rendered the outside skin of the grain so tender, that the floury portion of the seed soon liquified; and water alone produced the same effect. The next trial was made by dipping the grains into oil, and then planting them pretty deep in the garden pots placed in a saucer partly filled with water; this was successful, and two plants were produced, one of which was placed in the open ground, the other received the protection of the greenhouse. Of course much curiosity was excited on the question of the species of wheat common in those early periods. The plant exposed in the open air was much injured by frost and hail, but late in the season produced a few ripe ears. That in the greenhouse flourished and produced several heads which underwent minute examination, and proved to be what is now called *Talavera Wheat*; its botanical character is *Triticum vulgare—spica loxa, mutica, alba, glabra.* It was incidentally mentioned that grains of Indian corn had been found in the tombs of some of the Incas of Peru, which had been brought to vegetate.

The conversation subsequently took a very interesting turn on the subject of the powers of vegetation of seeds, particularly of the grasses gathered in an unripe state. Dr. Kurr of Stuttgardt, stated that he had succeeded in sprouting seeds of wheat gathered immediately after the blossom was over.

Professor Mohl repeated the observation of De Candolle, that in these cases vegetation took place quicker, as the process of the return of the floury part of the seed into a saccharine state was thereby rendered unnecessary. To understand this observation, it is perhaps necessary to state, that previous to ripening, the seeds of most grasses are milky and sweetish; the act of ripening changes this milk into a farinaceous or floury substance, destitute of sweetness but fit for food. Just before the seeds which are committed to the earth, sprout, this farinaceous substance again becomes sweet, and it is probable that this saccharine juice is the first food of the young shoots. The operation of making malt for the brewer, is the action of producing this last change—the barley is soaked until it just sprouts, the farther vegetation is then stopped by a drying heat, the floury part of the grain becomes saccharine, and when steeped in hot water produces a sweet liquor which ferments, and is beer.

From Loudon's Gardeners' Magazine.

CRIMSON CLOVER—TRIFOLIUM INCARNATUM.

The cultivation of this plant is, we are glad to hear, spreading rapidly; and it is in some parts of the country very generally taking the place of tares, as it produces a much greater quantity of food, and does not require much more than a tenth of the labor bestowed in preparing the ground and sowing it. It also comes in a fortnight earlier.

From the Yankee Farmer.

THE MAGIC ONION.

It is sometimes called the Canada, sometimes the tree, or top onion. This is a singular plant, and deserves cultivation, not only for its domestic use, but also as an object of curiosity. All other plants raised in the garden are oviparous, or in other words, re-produce their species from seeds or eggs, but this alone is viviparous, and brings forth its young alive; in clusters of four or five, around the parent stalk. These continue to enlarge, until their weight brings them to the earth, where if not prevented, they take root, and the maternal stalk now becomes useless, dries off, and the next season, these in their turn become parents, and re-produce a numerous progeny.*

This species of onion is raised with less art than the other. If you would them in perfection, make your ground ready as for the other kind; then stretch a line ten inches from the alley, and with a small hoe make a furrow two inches deep; in the bottom of this place set the top bulbs, or infant onions, five or six inches apart with their points or heads uppermost; then fill up the drill with the hand or broad hoe. This done, remove the line back a foot, and in the same manner plant as many as you please. In setting out these bulbs, you should not place the large and small ones promiscuously together, but separate the large from the small, and plant them in different rows; for the largest will generally become breeders, this season, while the small one will enlarge and swell into beautiful onions, fit for any use in the kitchen.

The magic onions intended for seed, or breeders, should be two years old and the largest and best of their kind. They must on no account stand near the other species of seed onions, for they will degenerate, and a mongrel race ensue.

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* This curious manner of being propagated is not peculiar to this onion. It is possessed also by that pest, the wild garlic, in addition to the increase of the latter by new roots (or tubers) which commence their growth under ground.—Ed. Far. Reg.

From the Horticultural Register.

MR. VAN MONS' METHOD OF RAISING GOOD FRUIT TREES FROM THE SEED.*

Translated from the French, by H. A. S. Dearborn.

Extract from the translator's introduction.

"In the whole history of discoveries, there is no one who is entitled to higher commendation, for the attention and industry bestowed, as well as for that remarkable fidelity of design, devotion of purpose and indomitable perseverance, which were evinced. Alone, unaided, unpatronized, and in fact discouraged—if it were possible to discourage such a man—by the total absence of favor and protection, the prejudices and customs of the enlightened as well as the ignorant, and the appalling disasters he encountered, still he nobly sought to establish a theory, which if even found correct, was not of a character to produce immediate eclat, or affluence; and would require a period probably greater than was consumed in the experiment, to give general publicity to his fame. He appears, in the course of his arduous and prolonged researches, like the incarnation of wisdom awaiting, with cool, collected, and determined resolution, for the recurrence of results, which, when obtained, afforded no other compensation or honor, than the enjoyment which a great mind derives from the discovery of a new fact, or the correctness of a hazardous conjecture.

"The theory and experiments of Mr. Van Mons have established a most important era in the history of pomology. It has resolved a question which, if ever even proposed, had bid defiance to all preceding ages. The comparatively small number of the varieties of each kind of fruit, were considered as the product of some other clime than that where they were commonly cultivated, or the accidental and mysterious present of fortune, in one of her sportive moods; but the success which has attended the experiments of the Belgian philosopher, has disclosed the process, by which nature accomplishes her wonderful work in the creation of new fruits, and has enabled man to avail of the secret, in such a manner, as not only to replace those which are necessarily exterminated by age, but to multiply the varieties to an illimitable extent.

"After the lapse of half a century, the great merit of Mr. Van Mons begins to be properly appreciated, and he has fortunately lived long enough to reap the only reward he desired, the gratitude of the world. There have been a combination of circumstances, which have had a most propitious influence, in giving notoriety to his highly commendable efforts. The rapidly increased taste for gardening and all branches of tillage, within the last thirty years, throughout western Europe and this country; the establishment of horticultural societies, and extensive nurseries; the attention which learned and eminent men have bestowed on useful and ornamental planting, and the numerous publications which have appeared for diffusing intelligence on all these subjects, seem to have been simultaneously brought in aid of the great labors of Mr. Van Mons; and to render them peculiarly interesting and acceptable. He has been fortunate, too, in the acquisition of such illustrious friends and colaborators, as Soulange Bodin and Poiteau, to comprehend and make known his valuable researches and precious contributions of excellent fruits. Those enlightened and generous heralds of his deeds, have rendered the name of Van Mons as familiar and dear to every intelligent cultivator of the earth, as those of a Cato, a Bacon, and a Du Hamel."

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"But there are unfortunately dark and odious incidents in the history of his country, and which have too often been the reproach of most nations—neglect and ingratitude towards one of its most illustrious men and greatest benefactors. Instead of being cheered on by public countenance and approbation, he received neither direct assistance or encouragement. Even protection from outrage was not afforded him; and three times were his invaluable nurseries exterminated under the sanction of the government. Still, in defiance of all the difficulties which he was compelled to encounter, he has triumphed gloriously.

"It is much to be desired, that Mr. Van Mons' theory should be adopted in this country, and more especially, as his process can be commenced at the point, which he was only enabled to reach, after extending his experiments through a period of forty years. It was not, until in the fourth and fifth generations of his trees raised from the seed, that they began to yield good and excellent fruit. He was obliged to begin with seed produced by wild trees; but in this country a great number of superior fruits have sprung up, as was predicted by Poiteau, from the planting of the seeds of successive generations of natural fruits. This has arisen from the manner in which our wide spreading population has been extended, which did not allow of that attention to the selection and propagation of the best varieties of fruits, by scions and buds; and nurseries are of very modern establishment, even in the oldest and most densely inhabited portions of the union. Besides the general inability to purchase and transplant to a great distance, valuable trees, the whole attention and labor of the pioneers of the wilderness, were required to procure the means of subsistence; and the luxuries of an orchard and a garden could not be obtained, until the necessaries of life were first secured, and even then fruit could only be generally multiplied, like the other products of agriculture; consequently, most of the trees have been raised from the seed, and having been commonly left in the natural state, their seeds have been again planted, and so on, from generation to generation, until we now find those superior kinds of fruit appear, in various parts of the United States, which

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*This article is not only valuable and interesting as throwing new lights on an important branch of agricultural science, over which total darkness has heretofore prevailed—but there is another source of interest presented in the detail of the long and untiring labors of Van Mons, under the greatest discouragements—and the successful results of his long course of experiment. In this point of view, M. Poiteau supplies for our journal part of the series of notices of distinguished agriculturists, which we have promised and already commenced, and which we hope hereafter greatly to extend.

The length of the account given by M. Poiteau, forbids copying (as above) more than a small part of the translator's introductory remarks.—Ed. Far. Reg.

Mr. Van Mons produced in the fifth generation. Such are many of our most celebrated apples, plums, cherries, pears, nectarines, and especially pears. The Andrews, Bloodgood, Cushing, Dix, Gore's Heathcot, Harvard, Lewis, Prince, Seckel, Wilkinson, and many others, may be classed with some of the best old, and newest European varieties.

Here then is an advanced position from whence to commence the experiment which Mr. Van Mons has so long and successfully prosecuted. Let the seeds from the fruit *borne on the parent trees* of those choice varieties be planted, and it is more than probable, all the trees thus obtained, would produce as good, and many of them superior fruits, to those of the originals; and their seeds being again planted and continued from generation to generation, the limit may be ascertained beyond which nature will not go, in the process of amelioration. At all events, taking Mr. Van Mons' theory as the basis of the experiment, we have the advantage of the generations which preceded, and may obtain results, in fifteen years, equal, if not superior to those he has only been enabled to reaeh in fifty years. We know not what is the generation of those extraordinary native trees. The ancestors of all the species of apples, pears, cherries, plums, and peaches which exist in a natural state, in this country, must have been generally grafted or budded trees, brought from Europe, and ten generations or more may have succeeded before they appeared in the perfection in which we now enjoy them, or not more than four or five."

THEORY OF VAN MONS, *or an historical account of the means which were employed by Van Mons to obtain excellent fruit from the seed.*

By A. Poiteau.

The great number of good and excellent new pears with which Mr. Van Mons has enriched Europe and North America, within the last forty years, seems to clearly prove, that the method he adopted to obtain them is superior to all others, as no one has obtained so many. Still although he never concealed his process, but published the principle with his catalogue of fruits in 1823, there has not been, within my knowledge a single nurseryman, or an amateur in France, who has attempted to practice it, either from a reliance in, or to verify the result.*

In 1833, the Royal and Central Agricultural Society of the Seine, offered a prize for good, and perfect new fruits; but the programme which was published by the society for that purpose, did not even name Mr. Van Mons's theory, or indicate any new method of arriving at the desired end, and left the competitors to the vague routine of sowing at hazard, and waiting until nature performed a miracle, in producing one good fruit among a thousand bad. Time will make known the result of the competitors; I shall therefore say nothing upon that subject at this time: but I cannot but regret, that in an age, when philosophers, chemists and physiologists are directing all their efforts to discover the process, or what is vulgarly called the secrets of nature, the Royal and Central Agricultural Society of the Seine, has not named Mr. Van Mons's theory—a theory which is now supported by so many repeated experiments, as to place it among the number of demonstrated truths.

I have said that in 1823 Mr. Van Mons published in a few words, the principle of the means which he had employed to obtain good new fruits. In 1828 I gave an account of some of these means in the "*Considerations of the process which is employed by nurserymen to obtain new ameliorated fruits, &c.*" published in the "*Annals of the Horticultural Society of Paris*," Vol. III. page 288. Now I call the principle of these means Van Mons' Theory, and my object is to indicate its origin, to develope it and to support it by reasons and facts, to attempt to demonstrate its solidity, to cause it to be adopted, and to present it as one of the most learned and most useful discoveries which genius and reason have made towards the close of the eighteenth century.

Mr. Van Mons, could most assuredly present and explain his theory infinitely better than it is possible for me to do; but fearing that his numerous occupations, and above all his modesty might prevent him, I hope, at least, to be able to give a sufficiently clear idea to excuse the audacity of writing upon the useful and important discovery of that learned and venerated professor: and, besides, the fear I entertain that Mr. Van Mons will not publish his theory, I believe I shall render an essential service to the history, and chronology of fruit trees, in fixing the epoch of the origin of this history, as well as of that of those numerous good fruits for which we are in debt to him. We should at this time be very grateful to our ancestors, if they had left us a greater number of data, on the epochs and the circumstances attending the appearance of the fruits which they have transmitted to us, and which will probably disappear in the hands of our offspring; we should have had a fixed basis to calculate their longevity, the degrees of their infirmities, and their deterioration, subjects which have now acquired great importance and which it is difficult to determine, because man does not live sufficiently long to ascertain the phases of the deterioration of fruits. Still as this deterioration, soon or late, is certain, we are very much interested, not to trust to chance, the replacing of the old fruits, in proportion as they deteriorate, by new fruits, at least as good if not better than the ancient, which we are fated successively to lose, in consequence of their great age, the feebleness of their constitution and the diseases by which they are attacked.

In this state of things we should consider the theory of Van Mons, as a very precious discovery, as it not only enriches us with new fruits, the greater part of which are superior to those which we possess, but gives us the certainty of being able to replace those which are inferior, or which have deteriorated, by new varieties of excellent qualities; it is applicable to the renewal of stone and seed fruits; but it is in that of pears we have the most numerous examples of its efficacy, Mr. Van Mons being more particularly attached to this kind of fruit, (without however, neglecting the others,) as superior, not merely from its qualities,

* I honorably except Mr. Bonnet of Boulogne-sur-Mar, an enlightened pomologist, who went several times to Louvain, to examine Mr. Van Mons' nurseries, and who has within three years sown seeds, according to the principles of that great master.

but from the length of time which several of its varieties may be kept.

Origin and Developement of the Theory of Van Mons.

Mr. Van Mons, a professor of chemistry at the University of Louvain in the Kingdom of Belgium, since 1817, was born in Brussels in 1765. To the most precious gifts of nature, by which he was favored, was added a good education. The study of physic, and chemistry early accustomed him to carefully examine whatever came under his observation, and to seek the cause of every effect which he saw. From the age of fifteen years, his ideas were fixed on the *natura rerum*, and since that time his meditations, his researches, and his continual experiments, far from producing a change, have but tended to confirm them. A taste for labor which he has never lost, and an ardent desire for the acquisition of knowledge, enabled him at the age of twenty years, to be received as a pharmacopalist, to write and speak all the languages of Europe, and to correspond with the learned men of all nations.

Although Mr. Van Mons commenced his pomological experiments when a youth, and has not ceased to continue them, his vast capacity was not filled; he studied medicine to extend his knowledge, wrote a thesis on physiology, a subject which was much agitated at that time, and received the degree of Doctor, in Paris. He was born with such strength of mind, that he wrote and now does, on the gravest subjects, in the midst of noise, in the company of persons who talk loudly on frivolous subjects, and takes a part in the conversation without stopping his pen.

Mr. Van Mons enjoyed the reputation of a superior man, and the consideration due to his transcendent merit, when the revolution of 1788 burst forth. Belgium was immediately incorporated with France and Mr. Van Mons was chosen a representative of the people. His great perspicacity enabled him to discover the labarynth without end, in which public affairs were involved, and he wrote a treatise on political philosophy, in which he stated that the continuance of our dissensions was the only way in which that true and solid peace could be found, which we might in vain seek in any other manner.

It is necessary for me to recal these circumstances in relation to the youth of Mr. Van Mons, to induce the reader to think, that when a man of such a temperament, establishes a theory on the regeneration of fruits, after having practised his experiments during fifty consecutive years, it will be received with much greater confidence, as it quadrates with the course of nature.

At the age of fifteen Mr. Van Mons sowed, in his father's garden, the seeds of perennial flowers, roses and other shrubs, with the design of observing the developement, the successive generations and the variations which might thus be produced. To these he soon added seeds and stones of the well known fruits, and remarked that of all his young plants, the pears were those which least resembled their parent. He searched the gardens, nurseries, markets and neighboring provinces, to confirm or rectify his first ideas, on the causes of the variation in the flowers and fruits.

At the age of 22 years the basis of his theory was fixed, and he was established as a pharmacopolist. At that time he had a gardener named Meuris, in whom he discovered a disposition for observation; he initiated him into his pomological views, and in a short time Meuris was capable of laboring with success, as well alone as with his master. In their journeys they bought every where, wild and free stocks of fruit trees, which had a favorable appearance. They were so familiar with the characteristics, which the aspect, and the wood furnished, that they could purchase as well in the winter as in the summer. When their explorations were distant they took up the trees, which they obtained even in midsummer, and removed them immediately. By means of these acquisitions and their repeated sowings, Mr. Van Mons had, in a short time, 80,000 fruit trees in his nursery, which enabled him to make his experiment on a large scale and to more promptly obtain results.

Here is an example of the rapid conceptions of Mr. Van Mons. At the commencement of the French emigration, the properties of the *Rush toxicodendron*, being so much extolled in Belgium, a leaf of this plant sold for from 6 to 7 sous at Brussels; Mr. Van Mons planted cuttings in his garden for this use of his phramacy; and going one day to see his young plants, he noticed a gardener who was pruning the trees without regard to any principle. He immediately hastened to find Mr. Villebon, who was the phœnix of horticulturists at that time, and asked him what were the rules for pruning fruit trees; the reply was, "you are too old to learn them." "In two years," replied Mr. Van Mons, "I will teach you, in a book, which I shall publish." He then began to consult the French, English, Dutch, Russian and German works, and found that everything was to be verified and rectified. His correspondence has proved to me, that he immediately became, himself, the best book to consult, not only on pruning fruit trees, but on an infinity of operations in culture.

His repeated sowings, without interruption from parent to son, of annual flowers, and perennial shrubs which grew and fructified in a short time; his new excursions, which were longer than the preceding, to observe the wild types of our fruit trees, in places where they grew and reproduced in a state of nature; his new generations, which were obtained from wild and free or natural stocks,* as well as from the first sowings in his nursery; and his thousand upon thousand of divers observations collected from every quarter, have enabled Mr. Van Mons to establish a law, which admits of fewer exceptions; this law is, that so long as plants remain in their natural situation, they do not sensibly vary, and their seeds always produce

* I have observed in Mr. Van Mon's correspondence with me, that he does not use the word *free* or *natural*, but that term with him is synonymous with *variety*. With us a tree is called *free* or *natural*, which is produced from the seed of a domesticated fruit, and in fact all trees which have not been grafted: thus we say a *free* or *natural* Rose, Camellia, Magnolia or Pear, when they are produced from the seed, cuttings or layers; and we particularly apply the epithet *wild* to pears and apples, which grow naturally in the woods, and whose fruit is not eatable.

the same, but on changing their climate and territory, several among them vary, some more and others less, and when they have once departed from their natural state, they never again return to it, but are removed more and more therefrom, by successive generations, and produce, sufficiently often, distinct races; more or less durable, and that finally if these varieties are even carried back to the territory of their ancestors, they will neither represent the character of their parents, or even return to the species from whence they sprung.

Mr. Van Mons has introduced wild pear trees, into the middle of his nursery, of the best perfected varieties; these wild trees, or subnatural species, as he calls them, have not varied and continued to yield poor acid fruit; the seeds of this bad fruit have been sown, and they have always produced wild trees, and although these wild trees flourish in the midst of the perfected varieties, the seeds of both being sowed neither produced any hybrids, from which, Mr. Van Mons concludes, that there cannot be a cross fecundation between a natural species and a variety. He does not deny that the species can be mutually fecundated, or that the varieties can also be in like manner fecundated; but he maintains, that the plants which are the result, never offer an appreciable resemblance, either to the father or mother. The origin, therefore, which Linnæus has given to the *Datisca canobina* may be considered fabulous. Besides, he does not believe that hybrids are so frequently produced, as has been alleged.

Mr. Van Mons has been the first to ascertain and assert, contrary to appearance and common opinion, that double flowers are not a variation, but rather a sign of what he calls *feebleness*. This assertion, which may be considered bold for the age, has since been ranked among the number of truths from the fact, that it has been ascertained, there is less solid matter in all the supernumerary petals of a double flower than there would have been in the seeds, if the flower had not been double.

But there is a point on which all will agree with Mr. Van Mons, which is, that the varieties of the most delicate fruits, are those which are the shortest lived, all things besides being equal; and from experiments which he has made, full credence will be given to the assertion, that a scion taken from an apple grafted on a paradise stock, or from a pear grafted on a quince, does not succeed well when placed on a free stock. Experiment, in fact, proves, that if the paradise and quince render the grafts more precocious, and give a greater volume to the fruit, they impair the vigor of the tree, and abridge its life, by not furnishing sufficient nourishment; and it is easy, therefrom, to conclude, that a scion taken from such a tree, has already been impaired. From these facts, Mr. Van Mons not only recommends that scions be always engrafted on free stocks, but that those individuals be selected which appear most to resemble in vigor and physiology, the varieties which are to be engrafted upon them—a condition very much neglected in sale nurseries. In those establishments, a subject having the appearance of a Beurre, or a D'Aremberg, there is grafted upon it a Blanquet or an Aurate, if it is found in the row destined for Blanquets and Aurates.

As I shall often have occasion to use the words *degeneracy* and *deterioration*, or their derivatives, it seems necessary that I should here fix the sense in which I employ them. Degeneracy, in culture, is applied to the seeds of fruits and flowers, which have been improved by variation. Seeds degenerate, or have degenerated, when the plants which are produced from them, no longer present certain qualities, which are found in their predecessors—qualities which they have acquired by variation. Philosophically, this is not a real degeneracy, but, on the contrary, a quality, a return towards the state of nature. As civilians, we say, that a man degenerates, if he abandons the social state, and the advantages, whether real or not, which he has acquired, at the expense of his liberty, and goes to enjoy his independence, and all his liberty, far from the chains of society, while philosophy says that this man resumes his rights, and re-enters into a state of perfect nature.

Deterioration, in pomology, applies to fruit trees and their fruits; a tree is deteriorated by age, disease, a poor soil, bad culture, an unfavorable exposure, the weather and adverse seasons, &c.; fruits are deteriorated by the same causes, except the old age of the tree which bears them, which old age, when it is not too far advanced, generally improves them.

The degeneration of the seeds of fruit trees in a state of variation, being the pivot of the theory of Van Mons, it is necessary that it should be clearly presented.

As long as plants in a state of nature remain in their natal soil, they produce, during their whole life, seeds which do not degenerate. Seeds taken from a Baobab that was two thousand years old, produced trees like itself, quite as well as those which it had borne at the age of twenty years. Wild pear trees, in a state of nature, and in their native soils, always reproduce seeds, without any sensible variation. It is not the same with plants born in the state of variation, either in consequence of having changed the climate, the territory, or from some other unknown cause. The seeds which a domesticated pear—that is to say, one which has been for a long time in a state of variation—yields at its hundredth fructification, produces trees not only very different from itself in consequence of its being only a variety—and the bounds of variation are not known in descending from parent to son—but still very different from the trees which have been produced from the seed of its first fructification; and the older a domesticated pear becomes, the nearer do the trees produced from its latest seeds, approach to a state of nature, without, nevertheless, being able ever to return to it, as Mr. Van Mons affirms.

Now let us examine how the annual culinary and ornamental plants are governed, which have been for a long time in a state of variation. The seed are annually sown, and whatever be the variation, which the new generation undergoes, it preserves the principal characteristics of its parent, and scarcely an individual is discovered, which exhibits a tendency to return to a state of nature. When beautiful balsams, and excellent lettuces are once obtained, they are easily preserved as such, and their variation seems, sufficiently often, rather an effort to become more beautiful, than a disposition to return to the wild state of their ancestors.

From these two extreme facts, and an infinite number of others which are intermediary, Mr.

Van Mons has arrived at this conclusion: that as the seeds of the first fructification of an annual plant, in a state of variation, produces plants, which may vary without removing far from the state of their parent, while on the contrary the seeds which are yielded by the hundredth fructification of a domesticated pear of excellent quality, or for a long time in a state of variation, produce a great variety of trees, which neither resemble their parent, and whose fruits almost always detestable, are more or less, near to a wild state; this difference should have its cause in an unfavorable modification—*in a degenaracy which the seed of the pear undergoes in consequence of the age of the variety which bore it.*

Having arrived at this conviction, Mr. Van Mons has said: by sowing the first seeds of a new variety of fruit tree, there should be obtained trees always variable in their seeds, because they can no longer escape from this condition, and which are less disposed to return toward a wild state, than those produced from seeds of an ancient variety; and as those which tend toward a wild state have a less chance of becoming perfect, according to our tastes, than those which are in the open field of variation, it is in the seminary of the first seeds of the newest varieties of fruit trees, that we should expect to find more perfect fruits according to our tastes.

The whole theory of Van Mons is contained in the above paragraph; it was to verify it, and put it in practice, that from that period he collected in his nursery young wild trees, young free stocks, and sowed large quantities of the seeds and stones of various kinds of fruit trees, in order to have their first fruits, and to sow their seeds in turn to obtain a generation, of whose novelty he was sure, and to take it as a point of departure for his experiments. Although Mr. Van Mons operated on thousands of various kinds and different varieties of trees at the same time, I will assume, in order to render what I say more clear, in explaining his progress, that he made his experiments on a single variety of pear.

As soon as the young pear tree with which he began his experiments, produced its first fruit, Mr. Van Mons sowed the seeds. There resulted a first generation, the individuals of which, although of very different kinds, did not resemble their parent. He cultivated them with care, and endeavored to hasten their growth, as much as possible, by all the known means in his power. These young trees yielded fruit, which were generally small, and almost all of them bad. He sowed the seed of these and obtained a second generation without interruption—which is very important—that were very different in kind, but did not resemble their parent, although they had a less wild appearance than their predecessors. These were cultivated with equal attention, and they fructified earlier than had their parent. The fruits of this second generation, also varied as much as the trees which bore them, but part of them appeared less near the wild state than the preceding; yet only a few possessed the requisite qualities to entitle them to preservation. Constant in his plan, Mr. Van Mons sowed the seeds and obtained a third continued generation, the greater part of the young trees of which, had a *phasis* of good augury, that is something of the physiognomy of our good domesticated pear trees, and they were consequently less various in appearance. Being carefully cultivated, as had been the preceding, these trees of the third generation, fructified still earlier than had those of the second generation. Several of them produced edible fruit, although not yet decidedly good, but sufficiently ameliorated to convince Mr. Van Mons that he had discovered the true path of amelioration, and that he should continue to follow it. He also recognised, with no less satisfaction, that the oftener the generations succeeded each other, without interruption, from parent to son, the more promptly did they fructify. The seed of the fruits of this third generation, which had a good appearance, were sowed, and the trees managed as carefully as the preceding, and produced a fourth generation, the trees of which were a little less varied, and nearly all of them had an appearance of favorable augury; they fructified in a shorter time than the third generation; many of the fruits were good, several excellent, but a small number still bad. Mr. Van Mons took the seeds of the best kinds of these pears, sowed them and obtained a fifth generation, the trees of which were less various than the preceding, fructified sooner, and produced more good and excellent fruits, than those of the fourth.

It was after the result of this fifth generation, from parent to son, that Mr. Van Mons made known the process which I have explained. Although having arrived at a most happy conclusion, and where others in his situation would have stopped, I know that he continued his experiments to 1834, and that he now does, and has reached the eighth generation, without interruption from parent to son, and that at each remove he always obtains fruits more and more perfect.

Mr. Van Mons made the same experiment upon almost all the other kinds of fruits. The apple yielded no other than good fruit in the fourth generation. The stone fruits, as the peach, apricot, plum, and cherry, became perfect in a still shorter time; all of them produced good and excellent fruits in the third generation; which should be the case, for our stone fruits always reproduce more or less good without any particular attention, and therefore they should with less difficulty and in a shorter time, arrive at a perfect state of amelioration.

After having presented in a succinct, but I hope a clear manner, the theory of Mr. Van Mons, and the means which he employed to put it in practice, it is proper that I should say a word as to the time which is required to obtain good fruit, in order that any one who wishes to verify or adopt it, can proceed according to his principles.

The first thing which preoccupied the attention and excited the anxiety of Mr. Van Mons, in the commencement of his experiment, was to ascertain how many years it required to arrive at the result which he sought to obtain; how many generations would be necessary, and how many years each generation would require to produce its first fruit. This first consideration, appalling to ordinary men, did not arrest Mr. Van Mons in his course. He put his hand to the work, and learned that three or four generations, without interruption, from parent to son, and from twelve to fifteen consecutive years, were sufficient to obtain no other than excellent fruit from the stones of peaches, apricots, plums and cherries: that to ob-

tain no other than excellent apples, only four successive and uninterrupted generations, from parent to son, and about twenty consecutive years, were required. As to the pear, the difficulty was greater, but not insurmountable, as we shall see. At first, Mr. Van Mons was unable to procure the seeds of varieties very recently procreated; the seeds which he was obliged to use to commence his experiments with, were obtained from ancient varieties, whose age, although uncertain, was much advanced, which from experience tended to retard the first fructification of his young trees. Nevertheless, Mr. Van Mons has been able to ascertain that twelve or fifteen years was the mean term of time which evolved from the moment of planting the first seed of an ancient variety of the domesticated pear, to the first fructification of the trees which sprang from them.

The trees from the second sowing of the seed of the first generation, have yielded their first fruit at the age of from ten to twelve years, as the mean term; those of the third generation, at the age of from eight to ten years; those of the fourth generation, at the age of from six to eight years; and finally, those of the fifth generation, at the age of six years. Mr. Van Mons being actually at the eighth generation, has informed me that he has obtained several pear trees which fructified at the age of four years.

From this decreasing progresson, it may be seen that the fear of a lengthened experiment ought to decrease in proportion as it advances, and that adding the requisite years in the first five generations of the pear, a point is reached where none other than good and excellent pears are obtained, at the end of forty two years. But if in each generation, as has been shown, there are always several trees which do not await the mean term named for their fructification, the time may be estimated that thirty-six years for obtaining from the pear, in five uninterrupted generations from parent to son, new trees and fruits, all of which are of excellent quality. The time can still be more abridged; for in one of his last letters, Mr. Van Mons informs me that from two of his first sowings of pears, there were trees produced which fructified at the age of six years.

I have collected much of what I have stated, and what I have yet to relate, in the nurseries of Mr. Van Mons, at Louvain; but it is from the correspondence of that venerated professor, that I have obtained the groundwork of my discourse; and as that correspondence had for its object my sole instruction, and not that of guiding me in a compilation which I had not contemplated, it follows that what I have still to communicate has not that natural connexion which I desired it should have assumed, and will consequently appear, to a certain extent, as detached articles.

When Mr. Van Mons commenced raising trees from the seed, he had already seen in other nurseries, that the seed of the varieties of the pear genus reproduced neither the characteristics of the tree, nor those of the fruit from which they sprang; therefore, he was not restrained, as may be said, to *raise by species*. But he had gone farther and ascertained that the ten seeds of a pear produced ten different trees, and ten differeut fruits. Still his manner of sowing is very near that of all nurserymen. He left his plants in the seed bed two years; he then took them up, and part of them he threw away as worthless, and transplanted the most vigorous at such a distance one from the other, that they could thoroughly develope themselves and fructify. He considered it best to plant them sufficiently near, in order to force them to run up tall, and to form pyramidal tops, without pruning; this hastens, he states, their fructification. I have seen squares of pear trees in his nursery at Louvain, at the epoch of their first fructification, and they appeared to be about ten feet apart. While waiting for the young trees thus planted to fructify, there is afforded an opportunity of studying their form and physiognomy, and to establish the prognostics of what they may become, from their different exterior characteristics.

Mr. Van Mons has ascertained that it is scarcely before the age of four years that young pear trees develope their characteristics; and that before this age, it is rarely possible to presume what each individual may become. It is not until the second or third year after the seedlings have been transplanted, that Mr. Van Mons begins to examine them for the purpose of ascertaining the prognostics of each individual. In the commencement of his experiments, it was sufficiently easy for him to recognise as good auguries in those young trees, which showed from their form, wood and leaves, a resemblance to our good ancient varieties. But as he obtained a great number of excellent new fruits, which presented new characteristics, sometimes analagous and sometimes opposed to those of our good old varieties, it was much more difficult to establish the data for ascertaining what the young trees raised from the seed may become; for he obtained excellent fruit from trees of a very bad appearance. Still from long continued observations, he has established the following prognostics:

1. *Prognostic of favorable augury.* A good form, a smooth and slightly shining bark, a regular distribution of the branches, in proportion to the height of the tree; annual shoots bent, striated, a little twisted, and breaking clean without splinters, thorns long, garnished with eyes or buds, their whole, or nearly whole length; eyes or buds plump, not divergent, red, or grizzled; leaves smooth, of a mean size, crimped on the sides of the middle nerve, borne on petioles rather long than short, the youngest, in spring, remaining a long time directly against the bud, the others, or the inferior, expanded, hollowed into a gutter from the bottom towards the top, but not their whole length.

2. *Prognostics of bad augury.* Branches and twigs confused, protruding like those of the hornbeam, or broom; thorns short, without eyes; leaves averted from the bud, from their first appearing, small, round, terminating in a short point, guttered their whole length. These characteristics indicate small fruit, flesh sweet and dry, or baking fruit and late.

3. *Prognostics of early fruit.* Wood large, short; buds large and near.

4. *Prognostics of late fruit.* Wood slim, branches well distributed, pendent, the shoots a little knotted, generally denote late delicious fruit; with leaves round, point short, stiff, of a deep green, borne on petioles of mean length, are analagous signs, but less sure.

I wish much, that Mr. Van Mons had indicated, by what sign we could determine, when a young pear tree promised large fruit, but he has been si-

lent upon this subject, whilst he has given, as the characteristic of good augury, an annual twig, which breaks cleanly and without splinters.

I have stated that Mr. Van Mons does not agree in opinion with those, who attribute the deterioration of fruit trees to their multiplication by repeated ingrafting; now I recollect that Mr. Knight has written, that if the parent tree of an ancient variety is found, it can be regenerated, by taking scions from it. This expresses with sufficient clearness that Mr. Knight, the most learned pomologist in England, thinks fruit trees of free stocks, or natural trees, deteriorate much less rapidly than those multiplied by grafting, which accords with the opinion of Mr. De Murinais, and Mr. Bonnet. Mr. Van Mons, on the contrary, maintains, that free stocks or natural and grafted trees, deteriorate in the same manner and with the same rapidity, in consequence merely of their age; and that it is age alone which causes our fruit trees to deteriorate, and their seeds to degenerate. The following is an example in support of his theory. In the course of his pomological experiments he discovered in an old garden of the Capuchins, the parent tree of our Bergamote de la Pentecote, which is at this time a sufficiently old pear, and all the trees grafted from it, are affected with canker in slightly moist land, aud the fruit is small, cracks when growing in the open air, is covered with black spots, which communicate a bitter taste to the flesh, and finally it no longer succeeds, but when trained as an espalier, along a wall. Very well: the parent tree of this Bergamote, was infected with all the evils which are found in those grafted from the same variety; Mr. Van Mons detached rooted suckers or sprouts, and at the same time took scions which he grafted on other stocks, and the trees produced from both, were neither more or less deteriorated, than those of our gardens, which have been for a long time, multiplied by the graft. Therefore, it is age only, to which should be attributed the natural and gradual deterioration of our varieties of fruit trees, as well as the equally gradual degeneracy of their seeds. I say natural and gradual deterioration, for Mr. Van Mons is not ignorant that there are certain morbific traits, which are communicated from the stock to the graft, and from the graft to the stock.

The subject of deterioration naturally leads to the inquiry how many years a variety of pear may live. Mr. Van Mons estimates that it may live from two to three hundred years, and that if at this age it is not extinct, its fruit is so deteriorated, that it no longer merits being cultivated; consequently he does not believe in the antiquity of fruits which, it is said, have been transmitted to us from the Romans.

Mr. Knight is of opinion, the deterioration is still more rapid, and assigns a shorter term to the existence of our varieties of fruit trees. This author even asserts, that it is not long since our old fruits were still better than they now are. But it is doubtful whether Mr. Knight can furnish the proof.

The thorns, with which the greater part of young free pear stocks are covered, disappear with age; but the tree can reproduce them in an advanced age, if a sprout is developed on the trunk, or if its vigor is augmented. Thus have I seen, in Mr. Van Mons' garden, pear trees renew their thorns, after having ceased to produce them. In Paris it is only necessary to head down a large orange tree, without thorns, to see it throw out new branches covered with them.

There are free stocks of old varieties of pears, which have the power of causing the fruits which are engrafted upon them, to grow to an extraordinary size—double, says Mr. Van Mons. It is a quality which the free stocks of new varieties do not possess, and which Mr. Van Mons cannot explain. In fact we often see trees which constantly yield fruit larger than others of the same variety, all things, in other respects, being equal. An inverse appearance, is often presented, to the florists of Paris; there are lemon trees, whose stocks become diseased, and cause the oranges which have been budded upon them to perish, in four or five years.

When the young pear trees, procreated from parent to son by uninterrupted generations, begin to produce edible fruit, they are generally summer fruits. It is necessary that the uninterrupted generations be more numerous, to obtain winter fruits, or such as keep long.

In proportion as the uninterrupted generations are multiplied from parent to son, the great differences which are first observed between the trees and their fruit, diminish in an inverse progression; wild forms, or appearances are no longer seen; all of them have an air of civilization, and their fruits no longer deviate from good. In the last package of fruit which Mr. Van Mons sent me, a considerable number of the pears naturally take rank among our Beurres and Doyennes in form, volume and quality, and all these fruits to the number of sixty varieties, were the first of a sixth generation, without interruption from parent to son.

Mr. Van Mons remarks, that among the new pears, he has obtained, there are some which were several years in taking a fixed form; that several did not assume one, for from twelve to fifteen years, and that others never did. Our old varieties, without doubt, have been in the same situation, and he gives as an example of pears, which have never assumed a determinate form, our Bon Chretien D'Hiver; still it is a pear the most easily recognised, notwithstanding the variation of its form and size.

Mr. Van Mons considers it an invariable principle, that a graft does not bloom sooner than the parent stock from which it was taken. Nevertheless, a contrary opinion universally prevails among nurserymen. They often graft scions taken from young trees, in the hope of hastening their floration, and sometimes succeed; but, in this case it may be said, that the scion taken was predisposed to bloom, and that it would equally as soon have done so, if it had remained on the parent tree. It is the same with regard to buds. The first *Astrapœa pendula*, which bloomed in France, was a bud taken from a stock in the Garden of Plants, which did not begin to bloom, until several years after. Finally, there are so many accidental causes, which advance or retard the floration of grafts and their parent stocks, that it is difficult to ascertain whether they should bloom simultaneously, or one after the other, while numerous facts attest, that the multiplication, repeated by bud, accelerates the floration and diminishes the volume, in a great number of species.

Mr. Van Mons has ascertained, that it is advantageous to collect the fruit a little before it is

fully ripe, from which it is desirable to obtain seed for planting, and to leave it to become perfectly mellow, and reach a state of decay, before extracting the seeds or stones. He admits, with Mr. Knight, that the apple deteriorates less rapidly, and lives longer, than the pear. This cannot be doubted, when we compare the facility of rearing apple trees in almost any kind of soil, with the difficulty of finding one, which is suitable for the pear.

The learned professor much prefers the white thorn, *Mespilus oxyacantha*, to the quince, as a stock for grafting our ancient varieties of pears upon. Pears grafted on a thorn, he says, grow higher, have a more perfect pyramidal form, and produce their fruit nearer the trunk. I agree entirely in opinion with Mr. Van Mons; first, because the pear takes perfectly on the thorn, which is an indigenous tree, rustic, not difficult to cultivate, and of easy multiplication from the seeds; and secondly, because complaints begin to be made of the quince, not only on account of its three varieties giving dfferent results, but in consequence of its being deteriorated by its extended multiplication by suckers and cuttings; and because it does not succeed well, in all kinds of land. As to the choice of the best variety, an error, committed in this respect, in the nursery of Luxembourg, has excited great complaints on the part of those who have obtained pear trees from that establishment, which has proved for the thousandth time, that the quince tree of malformed fruit, is not so good for stocks, as that which yields pyramidal fruit. As to the superiority of the white thorn over the quince, it is a question which will soon be settled with us; for when the Horticultural Society of Paris received the collection of pear scions, which was sent by Mr. Van Mons in the spring of 1834, there were not a sufficient number of quince stocks, at command, for all of them, and Count De Murinais caused a portion of them to be placed on the thorn: they have taken perfectly well, grown admirably, and give the most favorable indications of a fortunate result.

From the data which Mr. Van Mons has given, we are induced to think, that the pears which do not succeed with us, unless trained as espaliers, against a wall, have not always required that favorable position,—that they are now irreclaimable, on account of the weakness of old age, the deterioration which they have sustained, and the decrepitude which threatens them, and that finally, a time will arrive, when in spite of our cares, they will no longer be good even as espaliers, and will be abandoned and become extinct. To illustrate the principle of that able pomologist on this subject, I will add, that when a variety is enfeebled by age, or its temperament exhausted, it is best to graft it on a quince, in order that it may receive only a moderate nourishment, and should never be put on a free stock, whose too copious supply of aliment would hasten its destruction.

Mr. Van Mons has remarked, that the new varieties of pears which he obtained by repeatedly planting the seed from generation to generation, without interruption from parent to son, neither possessed the rusticity or the longevity of old varieties, and that those whose fruit was the best, were also those which indicated the shortest term of longevity. All this is in conformity to the course of nature, and it is proper that we submit to it. Mr. Van Mons has given the explanation of this fact. When there is no interruption between the generations of our varieties of fruit trees, nature cannot reclaim her rights; she has not time to modify the seed according to her manner, to make them resume a part of their old wild character; but if a space of fifty years is left between two generations, the individuals of the second, bear the marks of rusticity, and a tendency towards the wild state, which nature had developed in the seeds of their parent during those fifty years. This in fact, happens, when the seeds of an old variety of a fruit tree are sown.

Here I am bound to attempt to present the opinion of Mr. Van Mons without alteration, and to add thereto my reflections, and some adverse views whether well or ill established; but finally it is time that I leave him to speak for himself and express in his own cogent style, his manner of observing the progress of deterioration and decrepitude in our varieties of fruit trees.

"I have remarked," he says, "that the most excellent beyond all others, least resist the ravages of old age, and become sooner old than the varieties whose birth preceded them; they cannot attain an age of half a century, without manifesting symptoms of decrepitude. The first of these symptons, is that of bearing less constantly and the fruit ripening later. The decay of the wood, the loss of the beautiful form of the tree, and the alteration of the fruit follows at much later periods. The varieties which have existed but half a century do not suffer from the canker at the ends of the branches, nor from diseases of the bark; the fruit does not crack, is not filled with a hard substance, covered with knots nor insipid or dry; the alternates, are but a year: these varieties can still be grafted on other trees, without their infirmities being augmented. It requires half a century more to end their sufferings, and the general destruction of the varieties is the only remedy which can be applied to its diseases. It is painful to think, that soon the Saint Germain, the Beurre Gris, the Crassanne, the Colmar and the Doyenne [St Michaels] must submit to this destruction. None of these varieties any longer succeed with us [in Belgium] except when engrafted on the thorn and as espaliers; but this success is at the expense of their commendable qualities. During my youth these varieties in my father's garden, presented superb trees, in good health, and rarely was there any imperfection in their fruit. *O quantum distans ab illis!* What a loss in a time so short—in the space of sixty years! I repeat, the advantage of youthful variation, is being without any imperfections."

I ask permission of Mr. Van Mons to doubt, a little, such an alarming rapidity in the enfeeblement of our varieties of Pears. I well know that almost all those, with which I have been acquainted for fifty years, are affected with different maladies; that in passing through the nurseries, trees are seen, which have been grafted from our fine pears, in the bark of the stocks of which, are numerous defects; the branches are cankered, the extremities of the young twigs are black and they lose their leaves before the natural epoch,—all diseases, which Count Lelieur places among the number of those that are incurable; but the author, although very particular, has nevertheless, found here and there trees upon which he did not

discover any disease, and which he allowed the gardener of the Emperor to introduce into the gardens of the Crown. I am well persuaded, that our varieties of fruit trees, considering their origin, cannot have the tenacity, the indefinite life of the natural species; but I also believe that there are imperfections, individual maladies, which do not equally attack the whole variety; that the variety, for example, we call Beurre Gris, which is in a state of decrepitude, is extinct in some places, while it still exists in others. Mr. Van Mons himself affirms it, in saying, that in Belgium, there are varieties, which no longer succeed, except as espaliers trained against a wall; and finally, I believe that, if scions had always been taken from the most healthy individuals to perpetuate the varieties, we should not have seen so many trees affected with diseases, which abridge their existence and which also contribute, for the same reason, to shorten that of the whole variety. If now then, it is adopted as a principle, never to take scions but from young and healthy trees, and to insert them only on vigorous free stocks, the varieties will be longer preserved in a healthy state, than is the case at the present time.

Still, whether the deterioration of our fruit trees, be naturally slow as I think, or rapid, as Mr. Van Mons and Mr. Knight have asserted, it is not less certain, and it is well to think of some method for replacing them. Our manner of sowing the seeds and trusting to chance, for obtaining a good new fruit, is not certainly the best, as experience has sufficiently proved. Besides, chance does not merit the confidence of a reasonable man, especially when the probabilities are adverse. It is necessary then to have recourse to science, which is founded on reasons deduced from particular facts, and from whence flows that which is called a principle; and when this principle agrees with the course of nature, and is not contrary to any known fact, it seems to me, that it should be adopted as a truth, and be employed with confidence.

Such is, in my estimation, the theory of Mr. Van Mons, and it is to be considered as the best and most prompt means of regenerating our fruit trees, that is to say, of replacing the old deteriorated varieties by new varieties, which are perfectly healthy and bear excellent fruit. I have presented, as clearly as was in my power, the process employed to put it in practice, to induce the friends of our country to naturalize it; and in order to inspire more confidence, I have dared to say a word on the transcendent merit of its author, for which I ask a thousand pardons of his modesty.

I might yet add to this corollary many remarks, made by Mr. Van Mons on fruit trees and their culture, for his correspondence is very copious in facts; but I believe I have said sufficient to support the theory of this learned professor. I therefore, hasten to complete my memoir, by fixing the epoch of the removal of his nursery from Brussels to Louvain, and giving an idea of the incredible obstacles which he was obliged to encounter, in his pomological career, instead of the encouragements which were due to him, and shall finish, by a description of some of the excellent fruits obtained by Mr. Van Mons, and few or none of which are yet known in France.

After Mr. Van Mons had been a distinguished professor of physic and chemistry for seven years in the central school of the department of Dyle, and after the fortunes of war had separated Belgium from France, King William rendered justice to his merit, by naming him professor of the same subjects in the University of Louvain, in 1817, six months even before that University was re-established. Louvain being only about six leagues distant from Brussels, Mr. Van Mons could at the same time perform his duty as professor, superintend his nursery, and pursue his experiments. He was then at the apogee of his pomological career; he had more than 80,000 trees in his *Pepiniere de la Fidelite* [Nursery of Fidelity] the greater part of which were pears raised from the seed; several compartments were in their fourth, fifth, and sixth generations without interruption, from parent to son, and produced delicious fruits. He had for several years sent scions to Germany, England and the United States of America; nevertheless, except his friend Bosc, Mr. Vilmorin, Mr. Leon Leileric, and Mr. Bonnet, there was scarcely an individual in France, who knew that Mr. Van Mons existed; such is the empire which routine and apathy has among us. The English and American catalouges are filled with Mr. Van Mons, fruit; and it was not until 1834 that we find a few of them described, in the new edition of Mr Noisette's *Jardin Fruitier.*

To decide upon the character of these new fruits, Mr. Van Mons assembled three or four friends who were superior judges; they tasted them, wrote down the qualities of each, and Mr. Van mons preserved only the trees that produced fruit which was decided to be good and very good; the same proof was repeated two, three, and four times in succession, and it was not until after these repeated trials, that he decided to take grafts from the trees which bore them. On this subject, I should here make a few remarks, to dissipate the doubt which some persons still entertain, on the care which Mr. Van Mons took to propagate only excellent fruits. In the first place, it should be observed that every year is not favorable to the perfect development of the good qualities of fruit, and that if a fruit generally delicious, is tasted for the first time, in an unfavorable year, an inferior quality may be discovered. It was thus that in 1833 I did not find in several samples of *Poiteau's pear* those excellent qualities, which Mr. Van Mons had recognised during four successive years, and which had determined this learned man, from motives of friendship, to honor me by affixing to it my name. In the second place, it was always impossible for Mr. Van Mons to collect the scions himself, as he was too much occupied, which explains why it sometimes has happened, that an indifferent variety has been received, instead of a kind worthy of propagation. It was evidently from an error of this kind, that Mr. Vilmorin received, under the name of Beurre Fourcroy, a Pear tree of a very late kind, the fruit of which had no merit; for Mr. Van Mons had tasted the Beurre Fourcroy several years in succession, and had found it worthy of being dedicated to that most learned chemist, who had accepted the dedication, a little time before his death.

Mr. Van Mons fully enjoyed the result of his long continued experiments; he was happy in diffusing with real disinterestedness, and the greatest complacence, his new fruits, the greater part of which were superior to those with which we are acquainted, when in 1819, *exabrupto*, the land on

which his *Nursery of Fidelity* was located was decided to be indispensable for streets and building lots, and he was summoned to vacate it in the short space of two months, under the penalty of seeing all his trees cut down and thrown into the fire. Such an injunction would have been fatal to many persons, other than such a man as Mr. Van Mons; he was sensibly affected, but not frustrated; his noble character, his profound knowledge of men enabled him to surmount this reverse of fortune and disposed him calmly to seek elsewhere, another place for his establishment. As professor in the University of Louvain, he resolved to transport his nursery to that city, that he might have it under his management, without leaving the University; but the period assigned for evacuating the land was unfortunately, that of mid winter,—from the first of November to the last of December. Mr. Van Mons had at his disposal, only a part of Saturday and Sunday in each week, when he could go to Brussels; to collect the scions, to mark the most precious trees and give the requisite orders for the others, was all that he could do himself: and another garden as extensive as that which he evacuated, was required for the reception of his trees. His loss was consequently great and irreparable, from the unfortunate position in which he was placed, being obliged to confide nearly the whole of the care and labor of removal, to persons not well qualified, and who were incapable of comprehending the deep interest which he felt for the preservation of his trees. It was with great difficulty that he saved a twentieth part of his nursery, and this twentieth consisted only of scions for grafting. The remainder were sold or given to whoever would take them. After such a catastrophe Mr. Van Mons considered it necessary to guard against being ever again exposed to such a calamity. But incapable of distrust, he hired a piece of land in Louvain, which unfortunately belonged to the city, as a receptacle for the ruins of his nursery at Brussels, and continued his sowings and experiments.

Except, having a great number of young plants broken down and drawn out of the ground, by the masses of ice which were left on the ground for several days, after a great freshet in the river which passes through Louvain, occasioned by an unusual thaw in 1830, and which overflowed his nursery to the depth of seven or eight feet; if, I say, we except this flood, Mr. Van Mons enjoyed more or less quietly his new location, during thirteen consecutive years. His correspondence was renewed and extended, his losses were replaced by new acquisitions, the mass of his observations were augmented, and he continued to introduce into his nursery good new fruits, obtained by other amateurs, such as Messrs Coloma, Capiaumont, D'Hardenpont, the Abbe Duquesne, Gossart, Wirthum, Derlenfcourt, Diel, Liart, Knight, and an hundred others, and he distributed scions of these good fruits simultaneously, with those of his own; for his sole end has always been to multiply those which were good, and to enable the whole world to enjoy them. But he never sacrifised anΛ trees raised from the seeds, to receive the scions which were sent to him from all quarters—even from North America, before the character of its fruit had been decided: he therefore annually purchased stocks for the reception of the grafts, which were sent to him and for preserving his own varieties, that he might more liberally disseminate them. For this purpose, he adopted, in his nursery at Brussels, a kind of grafting which he calls *graft by copulation*, and he continues to practise it at Louvain with great success.

Until 1823 Mr. Van Mons had not distributed any of his trees or scions, without numbers being attached to them, which corresponded with similar numbers affixed to the parent-stocks in his nursery, that enabled him to answer all the queries which might be addressed to him, by the persons to whom he sent scions. At this period, having been confined to his bed by a severe wound, he compiled from his registers and published a catalogne, in which we find about 2000 varieties of fruits, in which the names are placed opposite the numbers of those from which scions had been taken and distributed, makes known the principle of his theory, describes some of the details of his culture and his manner of making experiments: there are also in it some remarks on the causes which compelled him to abandon his nursery at Brussels. There are several things worthy of attention in this catalogue; first, the interruptions in the series of numbers; for example, in the second series we find number 850 immediately after 840, which indicates that nine intermediate numbers were attached to nine trees of favorable augury, but whose fruit had not yet been decided upon as to quality: second, the names followed by the words *by us* naturally indicate that the varieties thus designated have been produced from the seeds by Van Mons; third, when the name is followed by the words *by its patron*, they indicate that the name of the variety is that of the person who has obtained it from the seed. But there is one very important thing which Mr. Van Mons did not think of, and which would have been very useful in the history of fruit trees, especially to ascertain the course and progress of their deterioration, this was, to have fixed the year of the birth of each of the new varieties, designated in his catalogue. Mr. Van Mons was alone capable of doing it: when I spoke to him about it, he replied that his intention had not been to establish a science, but rather to do a good act. which would be immediately useful by the dissemination of good fruits; still he regrets having left this hiatus, which his notes do not now enable him entirely to fill up.

As I have before stated, Mr. Van Mons enjoyed his fifty years of experiments, in enriching us with good excellent fruits; but *public utility* had sworn that she would finally embitter his old age. In 1831 we besieged the citadel D'Anvers, and although Mr. Van Mons nursery was fourteen leagues distant from the army, the engineers could not find a more commodious place than that nursery, to bake the bread of the soldiers in; consequently a great part of Mr. Van Mon's trees were destroyed, having constructed their ovens on the ground where they grew, and the fruit of the others was exposed to pillage. Still the philosophy of Mr. Van Mons sustained him in this unexpected devastation; he hired two other tracts of land, into which he removed his young plants of the seventh, eighth and ninth uninterrupted generation, from parent to son; he was consoled because he had time to collect, although it was in the summer, scions of the trees which were sacrificed to afford a place for the erection of ovens;

but *public utility* had not yet exhausted all her severities against him. Unfortunately there was not a Chaptal in the council of the prince, and the engineer, seeing nothing, decided again in 1834, in the name of *public utility*, that Mr. Van Mons' nursery was the sole and only point on the globe, proper for the establishment of a gas-house for lightning the city. Heaven grant that these gentlemen may be enabled to see better for the future; but it is not in their power to prevent the true friends of intellectual light, and of public prosperity, from regarding their decision as an act of ignorance and the grossest vandalism.

Mr. Van Mons is actually seventy years of age; he has consecrated his whole, all his life, a larger part of his fortune to public utility, and yet it is the name of *public utility*, that they have slain him, assassinated him! O age of light, how dark thou art.

In the commencement of September, 1834, Mr. Van Mons, on sending me a box of pears which were the first of a seventh generation, observed in his letter, "when you taste these pears, the trees which bore them will no longer exist." In fact, I learned a few days after, that the destructive axe had prostrated these trees and many others, that the nursery was dishonored, lost, and Mr. Van Mons frustrated in his dearest hopes, which were to send us the products of his labor.

It is impossible to foresee, or rather I dare not express my fears as to what will become of the ruins of an establishment, which wanted encouragement, which was of a nature to elevate the glory of an empire.*

Note by Mr. Poiteau.

Count Lelieur of Ville-sur Ance, believes with Mr. Murinais and Mr. Bonnet, that the stock has an influence on the seeds of the graft. During his residence in North America, he saw in the environs of New York a red and a white peach which perpetuated their stone without variation; but when he had budded the red on the white and the white on the red, they neither produced fruit perfectly red, or perfectly white, the two colors were mingled.

FACT STATED OF REMARKABLE IMPROVEMENT IN LAND.

To the Editor of the Farmers' Register.

Amherst Co., June 25th, 1836.

As one of the advantages of your valuable journal consists in collecting the facts which may fall under individual observation, and thereby arranging the *data* on which to form correct opinions, permit me to communicate a fact which has fallen under my observation.

In 1832, in extending a clover lot, I included about three acres of a poor ridge, which I planted in the common corn field pea, for the purpose of clearing it of grass, &c. This crop scarcely returned me the seed. That fall it was sown in wheat, and in the following spring it was sown in clover and plastered. The crop of wheat was scarcely worth cutting, and the land was badly taken with clover: a sprig here and there seemed to struggle for a feeble existence. This clover was never fit to make hay, and hence was never cut; but it was grazed by calves each year. In the summer of 1835, this lot was fallowed and broken from 9 to 11 inches, and in October, sown in wheat: as the clover was too thin it was again sown in clover this spring, and the clover seed was harrowed in with a two-horse harrow with wooden teeth. The crop of wheat that is now on it is remarkably luxuriant, and most of it having fallen. Could this great improvement have proceeded from the deep fallow, or from the harrowing of the wheat this spring? It must have proceeded from one or both of these causes, as no other means have been used, except the plaster in the spring of 1833. The soil is a deep stiff red clay. This fact is communicated with the hope, that, by comparing it with the observations of others, it may assist in discovering the best and most efficient means of improving our land.

W. H. G.

GERMINATION OF WHEAT IN ICE.

To the Editor of the Farmers' Register.

Cumberland county, June 23d, 1836.

I covered my ice last winter with straw containing much loose wheat. In the month of May the grains of wheat which happened to come in contact with ice, vegetated; and the roots extended into the body of the ice, from four to six inches, having a most beautiful white, thread-like appearance. The grain seems to have germinated after forming a bed in the ice: each grain was surrounded with a small quantity of water.

The stalk was bleached an inch above the surface of the ice, the top green and healthy. I make this communication without comment, and am now convinced that grain germinates at 32° of Fahrenheit scale, which has been denied by many.

WILLIAM B. SMITH.

GENERAL DIRECTIONS AND REMARKS WITH RESPECT TO MULBERRY AND SILK CULTURE.

Extract from the Silkworm.

The first step of the silkgrower is to prepare food for the worms; and the first in this operation is to select a proper location and soil, and to make choice of the kind of tree which is to produce the leaves.

The best location for any kind of mulberry to feed silkworms is on a moderate declivity facing the east or northeast—the worst exposure are to the south-west, the south or the west, because

The danger, if any, of their being winter killed arises from their growth being prolonged, and their substance remaining soft till late in autumn. The southwestern, southern and western exposures continue their growth later, because they are warmer than the eastern and northeastern, and the frost takes them before the wood is hardened. When the wood is matured there is no danger of winter killing.

The soil most suitable for the nursery is a moderately rich sandy loom, mellow, dry and friable. For the trees, when, transplanted for feeding, a

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* I have learned that Mr. Van Mons has been ordered to evacuate the whole of the land before the end of February.*

* As the above was written in 1834, the nursery must have been destroyed in 1835.—Translator.

dry, gravelly or somewhat sandy soil; better two poor than too rich; not that the trees will flourish better, but the leaves are more nutritious and healthy for the worms, and cause them to make better silk: no matter how stony if the trees can have room to grow

The natural food for the worms are the leaves of the mulberry tree. There are several species and numerous varieties of the mulberry, the leaves of most, if not all of which are eaten by the silkworm; the most common are the black, the purple, the red and the white. The worms will feed on the first three, but the silk they produce is comparatively coarse. The white, or as it is frequently but improperly called, the Italian mulberry, is that on which worms have been hitherto chiefly fed, in Europe and in this country; but these now bid fair to be superseded by others recently imported from Asia, the chief of which are the Brusa and the Chinese, or *morus multicaulis*.

The Brusa is a hardy tree, far superior on account of the size of its leaves, to the White mulberry, but the Morus multicaulis, of which there have hitherto been some doubts respecting its hardiness, has now been fairly tested, and no reasonable question remains as to its taking place of all others. It is fully ascertained that it can be brought to feed a stock of worms in half the time of the White mulberry—that a given space of ground will produce from twice to four times the weight of foliage—and that a child can gather as much weight of leaves in a given time as two men, and that a given weight of leaves are worth a quarter more than those of the White mulberry: and besides all these advantages it is stated on respectable authority that it is more congenial to the health of the worms, and produces better silk.

The Chinese mulberry is at present chiefly propagated by layers and cuttings. The former mode is perhaps preferable for propagating on the same ground, the latter is best calculated for transportation. But little of the seed has yet been produced in this country, but will probably be plenty in a few years. When the trees are to be multiplied on the same ground by layers, they should be set so far apart as to leave room to extend the layers between them. When this is not intended, there should be room enough for them to produce their full growth of leaves without matting or choking each other. If the trees are set 19 8-10th inches apart, there will then be ten trees in a rod in each row, and when they get too large for that distance every other one can be taken up for sale or for transplanting, leaving five trees in a rod. The distance of the rows may be varied as fancy may dictate. If it is intended to pass between them with a cart or wagon, half a rod, or eight feet and six inches will be a convenient distance. To pass between them with a hand cart, the rows may be five feet six inches apart, which will give three rows to a rod. By the first plan, an acre will contain 3200 trees, and when every other one is taken out 1600. By the second plan the acre will contain 4800, and when thinned out 2400

The mode of preparing the ground, sowing the seed, setting cuttings and layers, will be found in the preceding numbers. For setting trees with roots, the best method is that proposed by Mr. Bestor which is given in the preceding number. If the business is commenced with the Chinese mulberry, most of the branches may be cut down in the fall, and separated into cuttings to set the next spring. The young shoots will produce leaves enough the first season to feed a small stock of worms, sufficient to procure eggs for the second season. By these few worms, a sufficient knowledge may be acquired to manage with a degree of safety the second year—when calculations may be made on some profit from the silk. The few worms fed the first year may be kept on rough boards covered with papers; but this is too slovenly a practice to be extended. Those who wish to proceed systematically, and who do not choose to build a cocoonery for the second year, are invited to call and examine the portable frame and hurdles which I have constructed, and which, if a little more expensive than rough boards and papers, will be found extremely convenient.

The plan of a cocoonery will be found in No. 7, which though it may be varied as fancy or convenience may suggest, will at least assist the constructer as a starting point from which to vary. But the general plan of feeding the worms on hurdles of net work, with some kind of slide under each to receive the refuse and filth, to be removed without disturbing the worms, will be found of indispensible necessity to any one who wishes to conduct the business with any regularity.

Various statements have been given of the quantity of silk which may be calculated on at different periods from the commencement, all of which are from good authority, founded on actual experiments. But as these experiments have been made by different people, the statements given of their results, as may be expected, differ also. As every person who goes into the business, will wish to form some estimate of what can be effected, to save my readers the trouble of searching the preceding numbers for data in scattered items, I will here give a statement, which, if the business is conducted with any degree of correctness, cannot be fallen short of.

I shall, in the first place, suppose the business to be commenced with the Chinese mulberry, and suppose an acre to be set with young trees or cuttings in rows five feet and six inches apart, or three rows in a rod, and nineteen and eight-tenth inches apart in the rows or 10 trees in a rod, giving of course 4800 trees. It has been ascertained that these young trees will yield half a pound of leaves each, the first season; but as I intend in this calculation, not to approach near the utmost limits, I will suppose them to afford only a few leaves to feed the small stock of worms necessary for eggs for the next season, which need not be over one thousand. I shall suppose only half a pound of leaves from each tree the second year, though it has been ascertained that they will yield a pound. I suppose the third year every other tree to be transplanted out, which will leave 2500 trees, from each of which I calculate a pound and a half of leaves this year, three pounds the fourth year, five pounds the fifth year, and seven pounds the sixth year.

It has been stated by some experienced feeders of silkworms, that 80 pounds of Chinese mulberry leaves will produce a pound of silk: the account, then, for six years, will stand thus.

Years.	*Trees.*	*Quantity of leaves each.*	*No. worms.*	*Quanty of silk.*
1st	4800			none.
2d	4800	8 ounces.	72,000	30 lbs.
3d	2400	1½ pounds.	108,000	45 do.
4th	2400	3 do.	216,000	90 do.
5th	2400	5 do.	288,000	120 do.
6th	2400	7 do.	264,000	210 do.

If the rows of trees are set 8 feet 3 inches apart, giving two rows to a rod, the quantity of leaves, worms and silk will consequently be one third less. All the difference in advantage will be, that by the latter mode possibly a little labor may be saved by collecting the leaves in a cart or wagon drawn by a horse, and in the former they will be taken in a hand cart or in baskets.

Respecting the white mulberry, the reports from full grown trees average from forty to sixty pounds of silk, and this not till twenty years old. Who then will depend on the white mulberry to feed silkworms, and wait 20 years to obtain forty to sixty pounds of silk to an acre, when the Chinese will yield profit the second year, and 200 pounds or over in six years.

As there are several varieties of breeds of the silkworm, it will be of importance in procuring the eggs, to select and sort them, so as not to have two kinds together; not only on account of having them hatch and pass through their various changes at the same time, but also to have the silk they produce of uniform quality, as that produced by different parcels of worms often varies in color, in fineness, and indeed in all its qualities. Respecting the choice of any particular variety, it would be impossible to give, in the present state of knowledge of the subject, any decided preference, provided they are kept separate.

There is another part of the subject which has yet to be decided by farther experience, and that is the question whether it is best to confine the business to one crop, or to extend it several in a season. There are some worms which complete their whole course of operations in about four weeks, and others which require six. But even with the six-weeks worms there will be sufficient time during the summer in any part of the United States to produce two crops. The only advice I shall venture to give in this case, is the same I have given in former cases, to proceed sparingly and cautiously in all new operations. On that ground, I should judge it most expedient to begin with one crop at first, and when experience shall have rendered the business familiar, the young silkgrower will be enabled to make his own calculations.

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TO PROMOTE THE EARLY BEARING OF THE APPLE AND PEAR.

John Williams planted seed in pots, in November, 1809, transplanted after midsummer in the following year, into the open ground—transplanted again in the autumn of 1811, six feet apart—pruned away every winter the trifling lateral shoots, leaving the larger laterals at their full length to the bottom of the plants, and gave a good exposure to the sun. At the height of six feet the branches ceased to produce thorns. One yielded fruit at four years old, and several at five and six years.—(*Rep of Arts*, 1819, *p.* 175.) Repeated transplanting retards the growth of wood, and induces premature maturity in the plant—it converts, for want of abundant nourishment, wood buds into fruit buds. It is calculated to produce early bearing, but not to produce stately long lived trees. Precocity in vegetables, as in animals, is rather indicative of short life. Frequently transplanting is often resorted to by the florist, in order to induce plants to produce double flowers, or to produce an abundance of flowers, and it is found highly efficacious in the balsam, coxcomb, &c. It deranges the natural organization of plants, and produces *monsters*, a term applied by botanists to double flowers. It is by a process like the one pursued by Williams, that Knight so early obtains fruit from seeds, the blossoms of which he fecundates artificially, and it is to this that we are probably indebted for many of the fine fruits that enrich our tables, and for many of the gay flowers that embellish our gardens.

From the Farmer and Mechanic.

VEGETABLE DYES.

There is a species of lichen, growing on trees, of a greenish color, which the country people gather, under the name of moss, which dyes a permanent orange color on wool. It may be gathered by bushels from the oak trees, hanging in bunches from the limbs. Lie or potash, we believe, is used to fix the color. The acrid herb called smart weed, or biting knot grass, is said also to dye a brilliant and unfading yellow. If these dyes are unknown to chemists, we think they ought not to be; and the scientific should not under-value an important principle, which their science may render five times more valuable, merely because they owe the discovery of it to the ignorant.

RULE FOR DETERMINING THE WEIGHT OF HAY.

Hay in the field rick, says Low, weighs somewhat better than 112 lbs, the cubic yard; after being compressed in the stack, it weighs from 140 to 180 lbs., and when old, 200 lbs.

From Paxton's London Horticultural Register.

ON THE TENDENCY OF PLANTS TO REPRODUCE THEMSELVES.

It is a general law of nature obtaining in both the animal and vegetable kingdoms, that, in order to perpetuate the species, each individual or pair of individuals, are so constituted, that by a union of their powers respectively, progeny is produced.

It is remarkable that in both those kingdoms the manner of production is similar. The eggs of animals are very similar to the seeds of plants; and the bulbs, and tubers, and suckers of plants bear a strong resemblance to the viviparous young of animals. Increase by division also obtains in both: the dividing of the polypi is exactly like the production and separation of the sporules of fungi and other inferior orders of plants.

But vegetables are endowed with greater powers of re-production than animals. The latter have only one manner of re-production, from which there can be no departure. Oviparous animals cannot bring forth young viviparously (except in a few instances among insects,) nor *vice versa*. Whereas among plants we find many that can re-produce themselves in three different ways, namely, by seeds, by offsets, or by suckers; and what is very remakable in such cases, is that whichever of these take the lead in productiveness, the other two are neutralized or nearly so; and this versatility of character may be made so subservient to the purposes of the manager, that he may have whichever of the three he may choose. If offsets be wanted from a bulb or tuber, or from a fibrous rooted plant, the flower stems must be cut off; and if seeds be the object, then every new offset or tuber should be displaced as soon as it makes its appearance.

We have been led to make these remarks from having observed (the first time in our life) in the Chelsea Botanical Garden, the flowers of the Jerusalem Artichoke (Helianthus tuberosus) nearly expanded. This is a circumstance which but rarely occurs in this country, owing, no doubt, to these plants being cultivated in rich soil, which induces the production of tubers rather than flowers.

But this last summer has been remarkable for its great heat and long continued drought, and consequently, the soil being exhausted of that degree of moisture necessary to the production of tubers, and extraordinary effort has been made by the plants to reproduce themselves by seeds, and which is quite conformable to the general law of vegetable developement, as instanced in other similar cases.

The ingenious T. A. Knight, Esq., S. H. Society, has founded a rule in practice on this very circumstance, as applicable to the potato. The greater number of the varieties of this useful plant re-produce themselves by both seeds and tubers at the same time. But it forcibly struck the inquiring mind of that gentleman that no plant can produce both in such quantity or perfection as one of them only. And he also knew that, by defructifying the top, additional energy would be given to the underground offspring. This was sound philosophy; and the results of manifold trials have been to confirm his doctrine.

On the same principle, other practical experiments are based. Both Dutch and other florists not only prevent their budding bulbs from flowering, but mutilate by cutting off the upper half of their bulbs, to cause an extra ejection of offsets. And our own exotic plant growers find it difficult to propagate some of the African bulbs without having recourse to the same manœuvre.

There are several other plants which show this property of re-production by other than the ordinary modes. Wheat, which is either an annual or biennial according to the time of the year at which it is sown, will, if repeatedly eaten or cut down, continue to produce side shoots, and ripen seed in the third year. The strawberry, if divested of its first flowers, will produce others and yield fruit in the autumn. A filbert tree, surrounded by a great number of suckers, seldom bears many nuts. Horse radish, whose growth is chiefly towards enlarging the root, seldom flowers or bears seeds; and many other similar instances may be adduced.

The knowledge of this power or faculty of plants is necessary to the practitioner, whether in gardening or farming. The first by directing the vigor to the useful members of the plant, may have them in greater perfection; and the second, by mowing his thin crops of grass early in the season, will much sooner obtain a thicker sward.

Extracts from the Journal of the Franklin Institute.

PATENTS FOR AGRICULTURAL IMPLEMENTS, &c., ISSUED IN NOVEMBER, 1835.

With remarks, by the Editor of the Journal of the Franklin Institute.

For a *Machine for cutting Straw*, &c.; Henry C. Jones, Salem, Warren county, Ohio, Nov. 7.

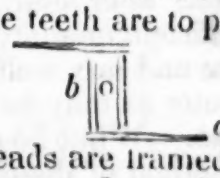
There is nothing in this cutting machine to distinguish it from a score or two of others, and of this the patentee seems to be aware, as he says that "this machine is operated somewhat similar to other straw cutting machines;" after which he proceeds to claim certain things which are of little or no importance, and some of them, withal, not new.

For a *Conical Arch Charcoal Burner;* Ezra B. Gilbert, Ephratah, Montgomery county, New York, November 7.

The claim made is to the before described conical arch charcoal burner, for manufacturing charcoal. Excepting in shape, we do not see in what particular this kiln differs from that patented by Mr. Doolittle, in 1829, and described by him in the seventeenth volume of Silliman's Journal, p. 396. We have long had by us a model of a charcoal kiln, exactly in the shape of that now patented. The person who sent it proposed obtaining a patent, but declined doing so when informed that there was not any thing new in the principle of it, or in his mode of application.

For an improvement in the *Horse Rake;* James Pudney, Stanford, Delaware county, N. York, November 7.

Two bars, each about seven feet long, are to have rake teeth fixed into them, at suitable distances apart, and about two feet long. These two bars are to be framed together by timbers at their ends, so that the two bars may be about two and a half, or three feet apart. The teeth are to point in opposite directions, thus, *a* where *a a* shows the points of the teeth, *o* and *b*, the timbers by which the two rake heads are framed together. When the rake is drawn forward, one set of points is on the ground, the others serving as handles, by which to guide it. When the rake is full, the upper ones are pushed forward by the person who guides it, and the rake rolls over, depositing the straw, grain, &c. The horse is geared to a frame, allowing of this rolling over, which frame is attached to the rake by headed pins, that pass through a slot in the timbers, *b*, which are double.



The claim is to the manner of using two heads, or rakes, and the self-adjusting slide, or groove, as the ends of the head bars.

For a *Machine for Cutting Straw;* Ashman Hall, Kent, Putnam county, New York, Nov. 7.

There is to be an angular knife, something like

an inverted V, and this forms one of the claims; a claim is made, also, to a board, which is to gauge the length of the straw, and, lastly, to a spring to raise the sliding board; the angular knife is not new, and boards for gauging have been often used in a similar way.

For a *Grist Mill;* Philip Hauser, Cincinnati, Ohio. An alien, who has resided two years in the United States; November 7.

The grinding part of this mill consists of a common conical shell and nut, like those of the ordinary coffee-mill, without a single feature of novelty either in form or substance. The claim is to "the general arrangement and combination, but not to the parts, taken separately." It is one among those gross pretensions at invention which would excite much surprise, were they little more rare.

For a *Smut Machine;* John Tuck, Columbus, Pennsylvania, November 7.

There is a stationary cylinder of sheet-iron standing on a suitable frame, its axis being inclined at an angle of about ten degrees with the horizon. Within this cylinder there is a second, which is made to revolve, the two being about three-fourths of an inch apart. They are both punched, grater fashion, their rough surfaces being towards each other. Within the inner cylinder there is a revolving fan wheel, extending its whole length. The grain is fed in at the upper end, between the two cylinders; the revolving of the inner one rubs the grain, whilst the wind from the fan, blowing through the apertures, discharges it, together with the cheat and cockle, the openings in the outer cylinder being made large enough for that purpose. The claim is to the machine generally, and "particularly to the shaft and spirally arranged wings for causing a current of air within the revolving drum."

For *Preparing Extracts of Bark for Tanning;* Otis Batchelder, Bedford Hillsborough county, North Carolina, November 7.

The following is the recipe: "Put such quantity of the extract of the bark into the vat as may be required; then put upon the extract, vinegar, or some other acid, in the proportion of about two gallons of vinegar to the hundred weight of the extract; after that, put on water, cold or warm, in sufficient quantity to cover the extract; then pulverize and mix well, and then add such quantity of water as may be necessary, and the liquor is fit for use. What he claims as his improvement, is the method of dissolving in cold or warm water, with the addition of acid, instead of boiling, as has been heretofore done."

For a *Revolving Screen for Cleaning Grain;* Edward P. Fitzpatrick, Mount Morris, Livingston county, New York. An alien, who has resided two years in the United States; November 14.

Instead of using woven wire, in meshes, as is usually done, the screen is to have wires running straight along it; of these there are to be several sections in the length of the screen, each section extending from one rim to another, which is fastened upon the axle for that purpose. The screen is to be inclined, and the grain fed in at the upper end, in the usual way; the wires in the first section are to be so close together as to allow only dust to pass; the next is to allow cheat to escape; the next small wheat, and the last large wheat. Between the last it is proposed to form the cylinder of sheet metal, instead of wire, and to punch it full of smooth round holes, large enough for the discharge of cockle.

The claim is to the placing of rods, or wires, lengthwise of the cylinder, from one groove circle to the other, at suitable distances apart for cleaning grain; instead of woven coverings, with numerous openings.

For an improvement in the *Smut Machine;* Edward B. Fitzpatrick, Mount Morris, Livingston county, New York, November 14.

This smut machine is to consist of an outer stationary cylinder, standing vertically, its periphery, being formed of longitudinal rods or wires, placed so close together that grain will not pass between them, whilst the dust from the smut will escape readily. Within this there are to be revolving beaters formed by extending square iron rods from one set of cross arms on the lower end of a revolving shaft, within the cylinder, to other similar cross bars near the upper end of the shaft, and close within the heads of the cylinder; these rods are to be made ragged at their edges, and placed near together on cross arms, extending from the shaft to the periphery of the cylinder. They are not to run directly along with the cylinder, but spirally, just as they would stand supposing them to be put in straight at first, and one of the sets of cross arms to be then turned half way round, thus giving a spiral direction to the rods.

The grain is to be fed in through the upper head of the cylinder, and to escape through an opening in the bottom head; but in passing down it is driven forcibly about by encountering the spiral beaters, the shaft of which revolves with great rapidity, and by this means, it is said, the smut is effectually removed.

The claim is to the above described manner of constructing a smut machine.

For a *Cheese Prees;* William C. Greenleaf, Andover, Oxford county, Maine November 23.

A follower is to be forced down by a toggle joint, the pressure being continued by hanging a weight to a lever, or arm, attached to the joint. The patentee says, "I do not claim the original invention of the toggle joint, but I do not claim as my invention its application to the purpose of pressing cheese." Independently of the toggle joint having been previously used for the purpose, such a claim we esteem as altogether worthless, for if a claim to the "application" is valid, there may be as many patents for one press as there are articles to be pressed. The law grants patents for any "new machine."

For a *Mortising Machine;* John M'Bride Richmond, Wayne county, Indiana, November 26.

In this machine, the chisel is made to advance upon the piece to be mortised, instead of causing the piece to move under the chisel. The chisel is to be acted upon by two compound levers, one of which is to be moved up and down by the hand. The fulcrum of the lever to which the chisel is attached, is on a kind of slide, which is caused to

progress forward by a pall falling into a rack. The precise way in which this is effected is not clearly shown, and, indeed, there is considerable obscurity in the description of the machine in general, so that a workman could not undertake to make it from the information furnished. The claims would not serve to convey any definite idea of the things which are the subjects of them.

For an improvement on *Tub Water Wheels;* Edward Newnam, Hendricks county, Indiana, November 26.

This is a poor contrivance, poorly described, and as poorly represented. The design, however, appears to be to double the power of the water, by letting it on at opposite sides of the wheel. The affair is without a claim, and is not worth one.

For *Hulling and Cleaning Cotton, and other, Seeds;* John Ambler, Jr., city of Philadelphia, November 26. (See Specification.)

For an improvement in the *Hydrant;* Sater F. Walker, city of Baltimore, November 26.

The claim under this patent is to "the mode described of constructing and using the ascending tube, so as to discharge the waste water at pleasure, either above or below the surface of the ground; the mode of preserving the distance between the valve seat and screwed nut at the top; and the making a waste cock of metal with a wooden key, and leather interposed." It would require considerable space to explain the arrangements referred to, and as we understand that Mr. Walker is about to apply for a new patent for certain modifications of this apparatus, we shall wait until these come under our notice.

For an improvement in *Grist Mills;* Samuel Hyde, Malone, Franklin county, New York, November 30.

This appears to be intended for a portable mill, although no dimensions are given. Both stones are to revolve in the same direction, the lower with a slow, the upper with a rapid motion. The lower stone is fixed upon a hollow shaft, and the upper upon a spindle which passes through it. The shaft of the lower stone runs upon "bead rollers," that is, upon round balls retained in a groove. The gearing we shall not attempt to describe, as this might be varied by any competent workman. The running both stones in the same direction, with different velocities, is claimed, and for aught we know, this claim may be sustained; but we are uninformed respecting, and cannot perceive, any advantage which can result from this construction, whilst it is open to the objection of complexity. The "bead rollers," at the bottom of the exterior shaft, are claimed, but they have repeatedly been applied to shafts, although soon abandoned, as they are theoretically and practically bad.

For an instrument for *Cutting Wood;* John Ruthven, city of New York. An alien, who has declared his intention to become a citizen; November 30.

This instrument is to be used as a substitute for mill, cross-cut, circular, and other saws. The cutting part consists of two steel edges, which are to operate like a paring chisel, taking off a narrow shaving, instead of tearing the wood by numerous points. A mortise is to be made on the edge of a blade, such a blade, for example, as would be fixed in a frame, in the place of a mill saw; and in this the cutters are to be secured, one edge pointed in either direction, so that the cutting may be effected both by the up and down strokes, the feed of the log, in this case taking place at the termination of each stroke. In the circular saw, the cutters will, of couse, all stand in the same direction, and the feed, we suppose, will be continuous.

When used for cross cutting, there are to be additional lateral cutters, to cut across the grain, like the fore iron in a cut-and-thrust, or a plane for cutting grooves across boards.

The claim made is to "the instruments described, and the method of cutting wood by them."

We very much doubt the general applicability of this method of cutting wood, instead of sawing it; a good mill saw may be fed half an inch at each stroke, whilst cutters, such as those described, cannot be allowed to cut more than an eighth of an inch, making a quarter in the double stroke. There will be a difficulty, also, in holding down the log in the up stroke, and the stuff will *spole* when the cutters arrive at the edges of the boards. The kerf, also, we apprehend, must be made thicker than with a good saw. The cross cutting appears to present other objections, which, with those already enumerated, we shall be glad to hear have been practically dissipated.

For a *Kiln for Drying Grain;* Thomas Crook, New Hope, Bucks county, Pennsylvania, November 30.

This patent is taken for an improvement upon a kiln for the same purpose, patented by Benjamin Parry, in the year 1810. In this kiln, it appears that the grain was fed into an inclined pan, contained in a chamber heated by a furnace and flues, the pan being agitated by a roller to cause the grain to descend regularly along it. The present patentee uses two pans, one above the other, and inclined in reverse directions, the grain falling from the first into the second; he suspends his pans by chains, and agitates them by a roller in a more convenient manner than heretofore. The claims made are to "the manner of arranging a second pan under the first, for the purpose described. The manner of strengthening the pans, as above, and the method of supporting them at the outside, by swing chains, instead of a roller."

For a Machine for *Cutting Straw;* John Wirt, Evansham, Wythe county, Virginia, November 30.

The whole of this apparatus is confessedly old, with the exception of "a cog wheel on the shaft of the cutting and fly wheel, working in the teeth of the crown wheel, on the end of the lower feeding roller, for feeding the machine." The same purpose has been effected by similar means, and that forty years since.

ON THE ECHELON CULTIVATOR AND EXPANDING HARROW.

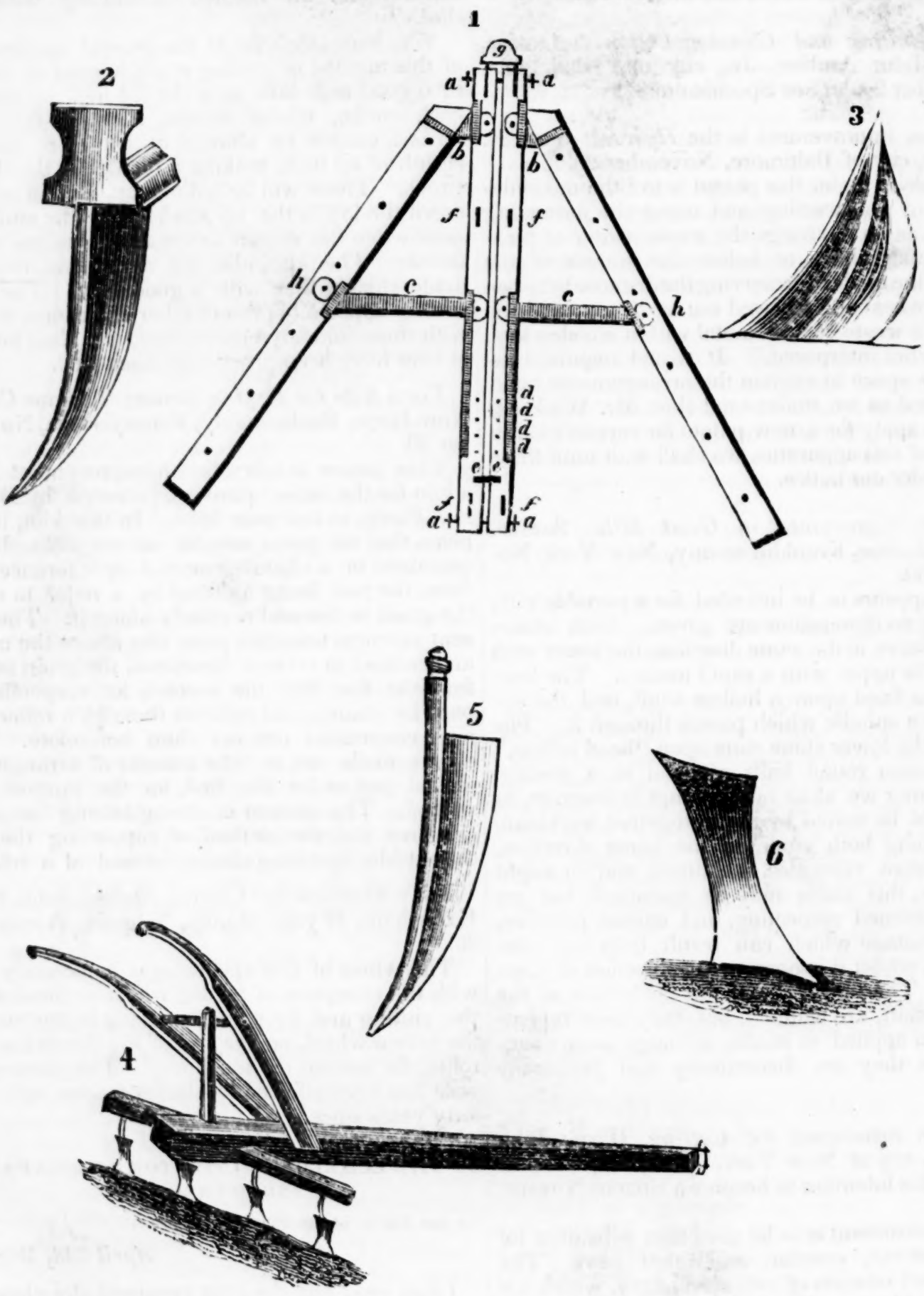
To the Editor of the Farmers' Register.

April 22d, 1836.

I now send you the long promised drawings of my Expanding Harrow and Echelon Cultivator.

The delay has been caused by my wish to give both a fair trial before I made any public communication for your journal in regard to them. But as yet, I have only been able to do it with the cultivator: for the supply of intelligent workmen falls so far short of the demand for them, in my part of the country, that I could not get any of the harrows made in time for corn planting. A more minute description, therefore, of their operation, must be po-tponed for another opportunity.

In recommendation of the Echelon cultivator, although it *is* my own contrivance, I think I may venture to assert that, wherever the soil is tolerably friable, and free from stumps, roots, and stones, having first been broken up, as usual, with a double plough, this implement will certainly save at least half the time and labor of after culture. Moreover, it may be set to run as deep as single ploughs commonly do: it will answer equally well too for cultivating any crop, the rows of which are wide enough for its passing to and fro between every two: it will throw the earth either to or from them, according as you turn the right or left end of the diagonal bar next to them; and in clean land, it will cover small grain effectually, in half the time of a single plough, and at a more uniform depth. Another advantage in using it is, that the only irons about it which are exposed to be worn out by the soil, are the cast iron points, and these admit of being twice worked, by turning end for end, before new ones are required.



Scale half an inch to the foot.

References to the figures. No. 1., the expanding harrow, here represented at its greatest expansion of 5½ feet. *a*, *a*, *a*, *a*, Eye-bolts to hold together the two middle pieces, which are rounded on the inside, to admit of the side pieces rising or sinking with the inequality of the surface. *b*, *b*, Iron tenons passing through the middle pieces, and playing on pins to admit the contraction of the side pieces. *c*, *c*, Small iron bars also playing on the pins *h*, *h*. By moving the inner ends of these bars to the holes *d*, *d*, *d*, *d* four contractions are effected, each less by 6 inches than the proceeding. *e*, *e*, Head of the central iron No. 2, which is so fixed as not to hinder the rising and sinking of the middle pieces of the harrow. *f*, *f*, *f*, *f*, Mortices for the handles. *g*, Coupling iron for the 2 clevaces.

No. 3, cast iron to fasten on No. 2 by means of the dove-tail groove behind. This, when the first point is worn out, affords a fresh point by being reversed; but is not large enough for opening the furrows to plant corn. To effect this, I intend to use a cast iron formed something like Sinclair's double mould-board plough, having also a dove-tail groove behind, to fit the same iron No. 2. The form, I presume, will readily be understood without a drawing.

No. 4. This represents the Echelon Cultivator; No. 5, the wrought irons fastened in the diagonal bar, and No. 6, the cast irons, each of which has 2 dove-tail grooves in the under surface, by means of which the points may be reversed. I must apologize for this drawing, as the teeth or cultivating irons have not the proper draft, or pitch, (I know not which to call it,) and the lower end of the handles ought to be represented as being fastened together by one staple on the upper surface of the beam.

Permit me, while writing of my own inventions, or improvements of agricultural implements, to say a word or two in favor of one, which, although long in use near Richmond, wherein it is made, was not known until 12 or 18 months ago, even to myself, whom many of my acquaintances accuse of being somewhat hobby-horsical on this subject. I mean the corn-sheller of Mr. Jabez Parker, machinist, whose manufactory of agricultural machines and implements is on the Main street, in Richmond, the next house below the Union tavern. There is abundant certified proof, in addition to my own experiments with this very valuable implement in a corn-growing country, to satisfy even one of Dr. Doubty's breed, that it will shell out ten barrels of corn per hour, if the grain be dry and perfect. It requires only two hands, of medium strength, to turn it with perfect ease; one to feed; one occasionally to haul away the cobs, which pass out unbroken and apart from the grain, (the two last mentioned hands to spell the two first at distant intervals,) and two or three of the youngest hands to supply the corn when near at hand; and it occupies little more space than a cutting box; of which, (by the way,) Mr. Parker sells *one* that will pay any purchaser much more than compound interest on the first cost. His corn-sheller, if geared to a wheat machine, has been certified to shell out at least one hundred and eighty barrels per day. The only possible objection I can see to it is, that a small portion of the grains of corn will be cut, unless they be of the hard, flinty varieties. This would be no objection where the corn was soon to be ground; nor can I see why it should be so when it is shipped, unless for a long voyage. In a word, it is the best corn-sheller, among six or eight varieties, that I have ever seen; and I take this occasion to recommend it, not only in the hope of encouraging a worthy man, highly useful to agriculturists, but of stimulating our brethren to exert themselves more than they ever have done, in searching out and examining for themselves the numerous agricultural machines and implements invented or improved by the mechanical genius of our countrymen, and whose great utility is thoroughly established with all who have tried them, although utterly unknown, probably, to three-fourths of our profession. This is the case, not only in regard to Mr. Parker's corn-sheller and cutting-box, but likewise with Fox & Borland's very superior portable wheat machine, also made by him, with a much improved horse power, which, I believe, is not made by any machinist in Virginia but himself.

The truth is, and it ought not to be concealed, nay, it should be exhibited in its strongest colors, that, in regard to all such matters, we Virginia planters and farmers too much resemble the inhabitants of a country called "*Lubber-land*," described by a writer in that excellent periodical "The World." These he represents as laying on their backs with their mouths wide open, expecting it to rain fat pigs ready roasted for their special use. Now, although *laziness* cannot be justly charged upon us as a characteristic vice, yet the *good-enough-palsy*, (if I may call a very old disease by a new name,) prevails, I believe, more among our order, than in all the other orders of society put together. Its invariable "diagnosis," as the doctors would say, is an utter contempt, manifested by looks, words and actions, for every imaginable thing called a *discovery* or *invention*. Its effects are perfectly congenial, and flow necessarily from their parent cause; for they preserve all upon whom they operate—all stultified by their paralytic influence, in a situation which an old Quaker friend of mine, formerly in Congress, used to call "*the state of statu quo*. To use an old adage, they are "*gum against thunder*;" and although surrounded by agricultural neighbors who have long judiciously availed themselves of every new thing really beneficial to themselves and their profession, these ineffably self-satisfied planters and farmers, triumphantly persist in believing that "the grand march of mind," *quoad* agriculture, had reached its "*ne plus ultra*" in the days of their fathers, and of course, that any departure, however small, from the course which *they and their fathers and grandfathers* had pursued, would be downright rebellion against supreme ancestral authority.

Believing you to be somewhat of a radical in such matters, I venture to address these remarks to you, with a request that you will indite us a homily upon the *good-enough-palsy*. If you will take the assurance of a friend who has never been a flatterer of any man, however idolized, you are able to do it with some effect; nay, if persuasion, and coaxing, and wheedling will not do, I know that you have caloric enough to clap the coal of fire, (if nothing else will answer,) on the backs of our terrapin agriculturists, that, when forced to poke their heads out of their shells, they may have at least *a chance* of hearing something for their own benefit. It will be, I confess, rather a dis-

couraging, if not a perilous undertaking; for many of them are testy and combative, as well as bigotted, and consequently obstinate; but I believe you have both the personal and moral courage suited to the occasion, and, at the same time, a willingness to receive aid, even from the most feeble of your true and sincere friends. Let me add, therefore, that, if "clapping on the back" by a willing coadjutor in this vital cause, can be of any service to you in making battle for it, you have only to call for such service, and it shall be, at all times, most cheerfully rendered without regard to personal consequences, by

Your old personal, political and
agricultural friend,
JAMES M. GARNETT.

For the Farmers' Register.

FERTILIZING EFFECTS OF CLOVER.

In 1835, S. M., in the county of Campbell, made 14 2-5 barrels (72 bushels) of corn to the acre on land, a hill side, which had been improved only by clover and plaster.

The seed was sown in 1832, and the clover, without being mowed or grazed, was permitted to rot on the ground three years. The owner thinks the product would have been larger if the corn had been planted closer, and that the crop would not have *exceeded* five barrels, before the clover was sown.

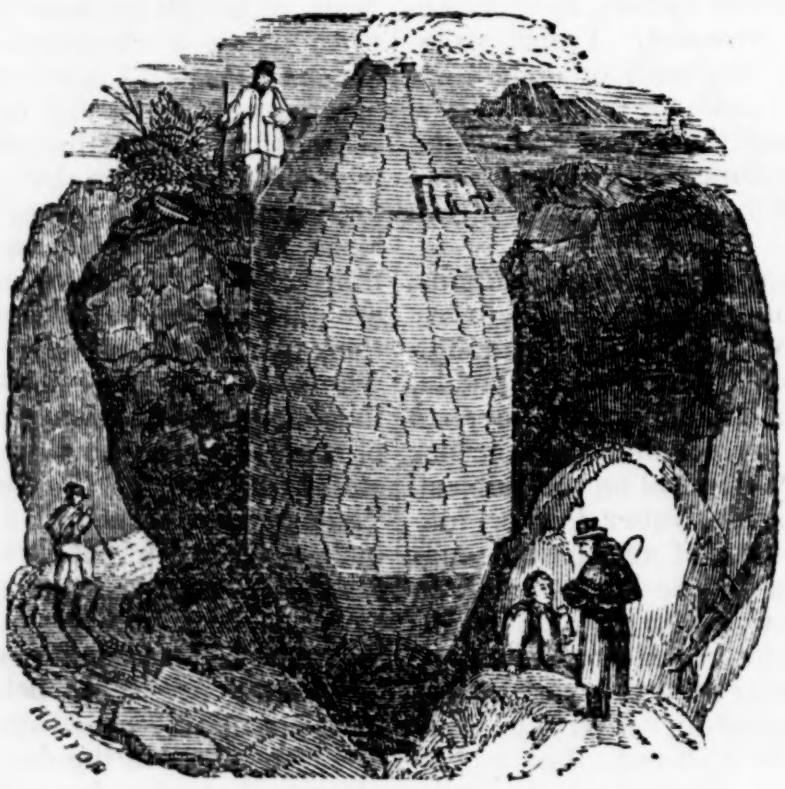
M. D.

MINERAL MANURES.

Extract from No. 46 of the *Farmer's Series* of the *Library of Useful Knowledge* first published in London, Nov. 15, 1833.

Lime Kilns.

The calcination of lime is an operation so generally understood in every part of the country where it is commonly found, that it scarcely requires to be described. Its effective burning is however a point of some difficulty, and the construction of kilns has occasioned much discussion. They possess various degrees of merits, but their description would occupy more space than can be afforded to the subject in the limits of this publication. We however extract the account of one designed several years ago by the late Bishop of Clogher—or, as other accounts say, by Mr. Rawson, of Cardington, in the county of Kildare*—which has since extended to several other parts of Ireland, where it has been found of the most essential service in the improvement of the moors and bogs, and is so simple as to deserve to be more generally known.



It is partly an inverted cone, and partly a cylinder, of which the annexed cut will afford an elevation.

The dimensions of the conical part are 8 feet high, and the diameter at bottom about 18 inches; the cylindrical part of the same height as the cone; making altogether 16 feet; though it is observed by the reporter that 20 feet in height—namely, 11 for the cylinder and 9 for the cone—would be preferable. The diameter of the cylinder, and of course also the largest diameter of the cone, is 8 feet. The kiln is to be fed through an iron door, and, when filled, should be shut close: a metal plate with holes, or a close grating, is placed at the bottom to give air to the fire, and two flues should be carried through the wall at about 8 feet from the eye of the kiln, in order to add to its force. It is also recommended that an outside wall be slightly raised at such a distance as that about a couple of feet of yellow clay may be closely packed between it and the inner one, as a precaution against its splitting, and the fire thus becoming exhausted. The fuel used is turf, and, when well attended by a couple of men and a boy, will turn out about 50 barrels of roche-lime in the twenty-four hours.† This kiln, together with an attached

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* Surveys of Tyrone, p. 113; and of Cavan, p. 68. See also a Prize Essay on the Construction of Lime-kilns, by Mr. Menteath, of Closeburn, in the Transactions of the Highland Society of Scotland, N. S., vol. ii. p. 127; and various remarks upon the construction of kilns, with explanatory engravings, in Malcolm's Comp. of Mod. Husb., vol. pp. 58—73.

four hours.* This kiln, together with an attached lime-house of 40 feet by 20, with walls 14 feet high, and a slated roof, only cost 60 guineas at the time it was erected. It would now probably cost considerably more; but still, when divided amongst a number of even middling farmers, the benefit which they might derive by its use would be considerable; for they appear to pay dearly at present for lime, and the sorry *pot-kilns* by which it is manufactured are so badly managed, that the use of it as a manure, though limestone is plentiful throughout the country, is yet upon a comparatively limited scale. Added to this, it has been broadly asserted, as a complaint that is not uncommon in England, that the professed lime-burners have their bushel measures made of basket, which, as soon as they wear away at the rim, annually diminish in size; so that carriages that formerly were known to contain only a certain measure, now carry considerably more.†

Although a kiln, such as that described, is comparatively cheap, yet there are many parts of the kingdom where the consumption of lime is not sufficient to induce the erection of permanent works by dealers, notwithstanding its use might be very advantageous, especially in bringing waste land into a state of cultivation. Even where coal is not found, yet, as such soils generally abound with peat, lime may be economically burnt upon the land wherever there is limestone within a convenient distance; of which an account has been lately published by Mr. Wallace, of Wigton, from which we extract the following particulars.

If peat be used, it should be first pared and dried. The site on which this substitute for a regular kiln is to be formed should be circular—say five or six yards in diameter: the soil should be dug up from off the subsoil; and then the operation of burning is to be performed in the following manner:—In the bottom of the pit lay a large quantity of furze, heath, or ling, upon which place about 2 feet in thickness of the parings, in the centre of which begin to form a funnel, or flue, of furze, encircled by peats, and around this lay about 6 or 8 inches deep of limestone, broken in small pieces. Then carry the flue up a couple of feet higher than the limestone, adding afterwards another layer of furze and parings about one foot deep, and then limestone, layer after layer of each, but still continuing the funnel; observing, however, that the circumference of each layer is to be lessened, until the whole assumes the form of a cone, or sugar-loaf, with the flue for its apex, or point. When this is done, brushwood, furze, heath, or any combustible matter, must be piled around, with peats to keep all together; and if the soil contain clay, clods may be added. Then set fire to the furze at the top or point of the flue, and the whole heap will burn down to the bottom with such effect, that within twenty-four hours the limestone will be completely calcined. If clay be added, it will also become sufficiently hardened to be easily reduced to powder, in which state, as we shall hereafter see, it may be converted to valuable manure; and the ashes may also be used as a dressing.* This method of burning lime has also the further advantage, that these pits may be dug on every part of the land where it may be wanted, as they may be filled up with the soil previously taken out of them; or if it be also an object to burn clay, the operation can be performed at the same time, and a great portion of the expense may thus be saved.

The kilns employed for agricultural purposes in this country, are generally placed against a high bank for the greater convenience of charging. They are mostly built with brick, but are commonly so ill constructed that they allow a great portion of the heat to be lost, consequently occasioning the loss of a great quantity of fuel—which usually consists of faggots and furze—and burning the lime imperfectly. There is, however, an economical mode of burning lime in stone-pits—or *pye-kilns*, as they are in some places called—detailed in the Survey of Derbyshire. It is in use by some farmers solely for their own land, but care is requisite when the process is performed by unpractised persons, as lime—particularly of the hot sorts—if burnt with too violent a fire, is apt to melt and run together, in which state it will not slake, and becomes useless, or what is termed *over-burnt*, and, in some places, *dead-lime*.† The fuel there used is coals; and it is calculated that about 25 tons will make 2400 bushels of good lime.

Compost.

Independently of the mixture of lime with the soil in the manner already stated, great advantage may also be gained by making a *compost of lime and earth*, which has been found to possess more fertilizing properties than when it has been laid naked upon the land; and a far less quantity is found to answer the purpose. The great objection raised by most farmers, is the heavy expense of labor, and also cartage, which is, in many situa-

* It is said 'that limestone can be burnt to better purpose, and at less expense, with peat, or turf, than with coal. When coal is used, the limestones are apt, from excessive heat, to run into a solid lump, which never happens with peat, as it keeps them in an open state and admits the air freely. The process of burning, also, goes on more slowly with coal. No lime can be drawn for two or three days; whereas, with peat, it may be drawn within twelve hours after the fire is put to the kiln; and in every succeeding day, nearly double the quantity of what could be produced by the use of coal. The expense too, is comparatively trifling, as a man and a boy will dig as many peats in one day as will burn 180 bushels of lime; and the expense, including drying, is not calculated at one-half that of the coal necessary for burning the same quantity of lime.'—Farm. Mag., vol. iii. p. 483.

† Kent Report, 2nd edit. p. 161. We also learn from Mr. Rawson—as a hint which may prove useful to extensive farmers who have occasion to prepare large quantities of steamed food for cattle—that he has, for several years, made use of a small kiln, constructed adjoining to his kitchen. The kiln-fire communicates with flues which heat all the necessary cooking apparatus; and thus dinner has been frequently dressed for fifty persons. A cowl over the chimney carries off the steam and sulphur; and there is a stage over the kiln for drying corn. Were the lime sold, it is calculated that it would more than pay for the whole charge of fuel and attendance.

* Quart. Journ. of Agric., vol. i. p. 187.

† Derbyshire Report, vol. ii. pp. 415, 440. See also other modes of burning lime with peat, as detailed in the Annals of Agriculture, vols. xxiv. p. 8, and xli. p. 318.

tions, so great as to prevent the operation. It should, however, be observed that the compost is, in many cases, chiefly composed of the scourings of ditches, and of pond-mud, in which instances the charge of labor must necessarily be incurred, and a great portion of the cost is thus saved. Another mode of reducing the expense, is also to plough up the headlands of fields in which the compost is intended to be laid. This is effected by ploughing the land as deeply as it will admit; and if the subsoil be not of such a quality as to occasion sterility, this mixture of fresh earth along with the surface-soil and lime, will prove highly advantageous. Virgin earth, indeed, if not in itself a manure, readily unites with lime, and richer composts are thus made, than with earth taken from the surface: the expense, too, is less, for a smaller quantity of lime can be made to answer the purpose. The lime should then be laid on in the state of shells, before it is slaked, and ploughed well in, to ensure its complete combination; the loose earth which escapes from the side furrows should then be shovelled up and thrown over the heap, after which a fermentation takes place within a very short time, if the weather be damp and warm; and the compost should be immediately laid upon the land, in quantity according to the quality of the soil to which it is to be applied. From 40 to 50 double cart-loads have been found a full dose to ordinary land, of which only one-seventh part of the compost was quicklime, which was considered equal in force to one-third of that which had been slaked. Nothing, however, can be more uncertain than the quantity of lime required, for it depends both upon the quality of the lime and of the earth with which it is to be mixed, as well as the state of the weather; but, from trials which have been frequently made, it would seem that two bushels of lime-shells will be sufficient for a cubic yard of earth of average quality; and 64 cubical yards of the compost—when properly prepared and applied to the soil—may be deemed a moderate dose for an acre of land; indeed, 40 have been considered a good dressing for light land, though more might unquestionably be, in most cases, laid on with better effect.* A dressing of this kind has been frequently found more effectual than one of farm-yard dung, which has been proved by such numberless experiments, that it is only necessary to mention the following:

1. The headlands of a strong soil, far from being of good quality, and the scourings from the bed of a small stream, having been collected and ploughed up, lime was mixed in a compost to the extent of about 96 bushels per acre, and laid upon a summer-fallow: the remainder of the field was dunged; but the superiority of the compost was evident, especially after the first crop. The effects of the dung also sooner ceased; and the ground where the compost was used was more pliant, and easier wrought, than where it had been omitted.

2. Some old yards, of a soft and sandy loam, were ploughed up with a deep furrow, and sufficiently harrowed, in the beginning of winter. Lime was then added, and turned in by the plough directly, in which state the ground remained till the spring, when it was ploughed and harrowed again, and carted to the field in the month of April, preparatory to barley being sown. A succession of good crops, of the same superiority, was the consequence.*

It would from this appear that, whether the compost consists of lime in a *hot*, or *effete* state, it will act effectually, provided the condition of the ground upon which it is to be used be such as to render a calcareous application beneficial; though there can be no doubt that the action of the former would be the most powerful. It must also be observed that, if the compost be composed of alluvial soil from the scourings of ditches, or pond-mud, or from peat—which substance will be separately treated of—perhaps three-fourths of the quantity already mentioned may be found sufficient. In contradiction to which, we extract, however, the following account of a trial made by Mr. Bailey:

3. This compost was of lime and decayed vegetable matter cut out in draining a bog, the site of an old pond of thirty-two acres: when mixed and mellowed, after frequent turnings for two, three, or five years—for some was not ready till then. It was chiefly applied on the fallows of old worn out tillage land, of a light nature, in one field of which the ridges were covered with the compost, and then missed alternately; and about 30 loads were also spread pretty thick on a sandy-soiled grass-field: but all without any apparent effect.†

Upon which it may, however, be observed, that the lime, if in a large quantity, may have been improperly laid upon 'worn out tillage,' and that the site of the pond, although described as consisting of decayed vegetable matter, may have also contained noxious substances which did not fall under the notice of the surveyor.

We cannot close this chapter without also adverting to the very just opinion generally entertained, that *'soils ought to be crossed;'* or, in other words, that composts, of which clay is the basis, should be administered to light soils, and the reverse. A petition has, indeed, been lately presented to the House of Commons, stating, 'that there are a few districts of the kingdom, however steril, which may not be brought to a successful imitation of naturally fertile soil by a *well-proportioned mixture of clay, sand, and lime;*'‡ and there can be no doubt that this amelioration of the soil, by the addition of earth of an opposite quality to that of which it consists, will, where such improvement is requisite, be found of great benefit to the land, for each acts as an alterative, and imparts properties in which the soil was previously deficient. The expense is, however, in most cases, so enormous, in consequence of the vast quantity which must be laid on to produce any sensible el-

* Brown, of Markle, vol. i. p. 409. 'If 80 cubic yards are considered to be a good medium dressing for a Scotch, or 64 for an English acre, 160 bushels of lime-shells will be sufficient. Now, the length of a head-ridge opposite to four ridges of 18 feet is 72 feet, and its breadth 18 feet. If this space be ploughed 10 inches deep, it will produce 40 cubic yards of earth at each end of the ridges; while the whole work may be executed by horse-labor.'—Gen. Rep. of Scotland, vol. ii. p. 549.

*Farmers' Magazine, vol. iii. pp. 328, 329.

† Survey of Durham, p. 219.

‡ Petition of Edw. J. Lance, Surveyor, presented on the 29th of February, 1832.

fect, as seldom to leave any profitable result. When the earth which is required to be added is to be found in the subsoil, then, indeed, if it be not at too great a depth, it may perhaps be dug, at those seasons in which labor is cheap, at a moderate expense; but those instances are rare, and the charge of cartage from a distance must prevent it from being undertaken by any man, although the owner of the land, who is not possessed of large disposable capital, or by any tenant who cannot secure the return of the outlay within the currency of his lease. Composts, however, may be very advantageously formed in the manner we have stated—by a mixture of lime with the earth on which it is to be laid.

MINERAL MANURES—*continued.*

MARL

Is a compound calcareous earth found in most parts of the world, and has been extensively used throughout this kingdom, where it is supposed to have been known to husbandmen at a very early period of our history. There are, indeed, leases on record, granted in the reigns of Edward I. and II., which compel the tenants to make use of it;† but, though still employed, it has been a great degree superseded by the more recent introduction of lime, of the properties of which it in some measure partakes. The term denoting it was formerly used in a very vague sense, for it is a substance consisting of various materials, and it has consequently happened, that what has been supposed to apply to one species, did not hold good when affirmed of another. Although principally deemed valuable on account of the calcareous matter which it usually contains, still its composition differs so essentially, that its influence as manure is but imperfectly understood; yet theoretic writings abound in general directions for its use, which are frequently found not to answer in practice, for their rules are drawn either from statements which have been made of the effect of its application on particular soils, or from analyses of its qualities, which, as these vary in innumerable instances, frequently lead farmers astray. Its real value can, therefore, be only ascertained through the practical experience of those who have either actually tried its efficacy, or who have witnessed it in their own neighborhood.

This ignorance of the distinguishing properties of marl has necessarily led to many mistakes in its application, which have occasioned the variety of opinions that are entertained regarding its use. In most places where it was anciently employed, and where its fertilizing influence was discovered to be eminently great, it was thought by many farmers that it could be made to supersede the use of dung; they, therefore, in many instances, sold their hay and straw, and although, notwithstanding this reduction of the quantity of putrescent manure, they still for a time obtained large crops, yet, eventually, the chemical effects of the marl exhausted the land. No second marling could operate upon it until it had been renovated by repeated applications of dung; and thus has arisen the old saying, cited by Barnaby Googe, who wrote so long ago as the middle of the sixteenth century, that *'lime and marl are good for the father, but bad for the son.'* In this manner, also, some valuable discoveries in agriculture have fallen into disuse through their mistaken application, when governed by local circumstances which were ill understood; wherever marl of a kind adapted to the soil has been applied, and that a judicious system of culture has been pursued, without either over-cropping, or neglecting the use of putrescent manure, the proverb is so far from being well founded, that the contrary may be safely affirmed.

The common *definition of marl* given us by the best writers on fossils, is—that it is composed of clay, sand, and lime, very intimately, but unequally mixed, slightly coherent, not ductile, but stiff, or viscid, when moist; most easily diffusible in, and disunited by, water, or even by exposure to the air, and by it reduced to a soft, loose, incohesive mass—for the most part composed of nothing more than calcareous earth—in which its chief value consists—combined with a little mineral oil, clay, and sometimes with ochre, or iron. It is also generally considered as a characteristic of marl, that it effervesces with acids, though to that various exceptions have been discovered; from which it has been supposed that, when deprived of that test, it contains no calcareous matter, yet it is found to produce ameliorating effects upon the soil.* Notwithstanding this summary description, its appearance is, however, as varied as its properties, being of color nearly pure white, to the darkest shades of brown and red, interveined with blue and yellow. It also exists in different kinds of land, is seldom found as a stratum of much length, but generally in detached masses at various depths, sometimes in wide and dense perpendicular layers, at others in streaks, running in lines parallel with the horizon, or again intersecting each other at right angles, usually resting on sand or gravel, and is classed, according to its qualities, into the following distinct species.

1. *Clayey marl*, which improves sandy land, and seems to act as clay in changing the nature of the soil. In land consisting of a mixture of sand and loam, or of sand and gravel, then, the

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† The Charta Forestæ, passed in 1225, mentions the right of sinking marl-pits; and Daines Barrington gives a quotation from Pliny (lib. xvii. c. vi.,) in which he mentions a substance used in Britain and France as manure, called *marga*, which he conceives is a mistake for *marla*. And in the Statutum Wallice, 12 Edw. I., the sheriff and coroner are directed to inquire as to marl-pits adjoining public roads, showing its then common use. The uses of marl and lime are indeed mentioned in a treatise on rural economy written in the Welsh language, and supposed to be from three to four hundred years old; of which a translation has been given by Mr. Davies, in his Survey of South Wales. It contains many curious and valuable remarks, which show that ignorance on the subject of agriculture did not prevail at that time to the extent which is generelly imagined.

* A bluish marl much used in some parts of Ireland, and long celebrated as a manure, makes no ebullition with acids; neither do several of the red marls; yet many of them are known to be productive of great improvement to land. See Dr. Rutty's Essay on the Natural History of Dublin, appended to the Survey of the County; and also Holland's Survey of Cheshire, note, p. 225.

application of this marl has been found peculiarly advantageous: and on all poor and thin sandy soils there is this further advantage in its use—that, from the large proportion of clay which it usually contains, it adds to their bulk and firmness, and thus has a tendency to bring them to that medium state which is the most favorable to the purposes of vegetation. It is more soft and unctuous than clay; indeed, upon slightly cutting it, it becomes so flexible, that it may be kneaded like dough, or paste, though, when the moisture evaporates, it falls into pieces: it therefore blends easily with the soil, and partaking more largely of calcareous matter, its effects, though slow, are in all the latter cases more fertilizing.

2. *Sandy marl*, which is far more frequent in Ireland than in any part of England, and is commonly found in pits of limestone-gravel, whence it is in that country usually called limestone-sand. It is seldom clammy or unctuous, like the clay marl, nor does it adhere to the tongue, but crumbles between the fingers, and feels gritty; when exposed to the air and moisture it slowly chips and moulders; and it partakes of some extraneous mixtures. Its color is sometimes like that of lead, or brown, approaching to black, and at others blue. As implied by its name, it contains an excess of sand over that of clay; for, upon analyzing it, the proportion of the former has, in most cases, been found to be from 60 to 80 per cent.; and it does not effervesce with acids so quickly as the calcareous marls. It possesses but a small degree of tenacity, and it has proved an excellent manure for clayey soils, mellowing their stiffness, and rendering them easier to work.

3. *Slaty or stony marl*, to which class, also, properly belongs that which is called *rotten limestone*, is chiefly applied to heavy land. Its operation is slow, but very lasting; land, forty years after it has been laid on, having been found to bear a closer and a better crop of grass than that which had been recently applied.

4. *Shelly marl*, which is evidently produced by the remains of testaceous fish, which, dying in their shells, become, in process of time, converted into calcareous earth, and their bodies, when decomposed, furnish a kind of mould composed of animal substance, which is no doubt analogous to the effect of dung. It is, therefore, highly fertilizing when judiciously applied to soils of every kind, which are either in themselves dry, or which have been properly drained.

Such are the most common denominations by which marl is usually distinguished, though it is susceptible of many subdivisions by those who affect to treat the subject scientifically. It is, however; more frequently classed under the sole characters of *siliceous*, *argilaceous*, or *calcareous*, according as sand, clay, or lime predominates in its composition; but, for all practical purposes, it may be sufficient to divide it into *earth-marl* and *shell-marl*.

Earth-marl.

The former, though in substance, as we have already seen, sometimes principally formed of sand, is yet, in most cases, chiefly composed of clay, and of the carbonate of lime, intimately combined, but mixed in very different proportions, by which its properties are necessarily varied. It acts as manure physically, or substantially, through the effect of the clay, in rendering soils tenacious; and chemically, by the operation of lime, in the manner which has been explained in treating of that fossil. These two substances are so completely amalgamated, that it is not possible, either by the eye, or even by a microscope, to distinguish the constituent particles of the one or of the other; the fact can, therefore, be only ascertained by chemical analysis, and the means which nature has employed in their combination is yet unknown; for although it might be supposed that mixtures of clay and lime would produce the same effect as marl, yet they will not fall to powder in the same manner when exposed to air; and it contains some other fertilizing qualities with the powers of which we are unacquainted. Thus, in the improvement of Chat Moss, in Lancashire, if a piece of marl was suffered to lie a few months upon the ground, it was found, on raising it up, that a considerable quantity of the moss adhered to it; and if the intermediate substance was examined, it appeared to be a mixture of marl and peat, formed into a mucilaginous mass of a dark color, and as soft as soap.*

Although it is very generally thought that extreme accuracy in philosophical experiments is useless in the practice of agriculture, yet it is particularly necessary to ascertain the precise difference between these modes of action; for, of course, either one or the other prevails, according to the greater or the less quantity of clay of which the marl is composed. Thus, to produce the first named, or physical effect, a much larger amount must be laid upon the land than when the second is the object; for clay can only be advantageously employed in that view upon soils that are too light; and consequently the marl must be laid in proportionate abundance, or it will not improve the condition of the ground; whilst a clayey soil would, on the contrary, lose some of its good qualities by the addition of marl, after the effects of the lime were exhausted. The intimate combination of these two substances in the composition of marl affords it, however, this advantage—that it divides, and falls to powder, with greater ease than can be effected by any artificial mixture, and therefore unites more readily with the soil.

On the other hand, if the calcareous matter in the marl be combined with sand instead of clay, or that there are, as in many instances, veins of calcareous sand intermixed, then it suits a clayey soil. The proportion in which these substances are combined is, however, so different, that they often vary in the same vein, and it is generally found that the bottom part is more calcareous than the top. From 15 to 40 per cent. is not unfrequently the portion of calcareous matter found in clay; that of a sandy nature generally contains a larger proportion.†

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* Communications to the Board of Agriculture, vol. vii., art. xliv. See also Stevenson's edition of Dickson's Survey of Lancashire, chap. xii. sect. 3.

† *Argilaceous marl* usually contains from 68 to 80 per cent. of clay, and from 32 to 20 per cent. of calcareous matter: but it has been found composed of 70 per cent. of calcareous, and 8 to 10 of sand, with clear signs of some iron.

Siliceous marl very often contains above 75 per

The stone marl of hilly countries is frequently still more abundant in calcareous substance; but it also, in many other places, contains such large quantities of extraneous matter, that it may be properly considered as belonging to the earthy species, and has, in some instances, been laid upon the land to the extent of 400 to 600 single horse cart-loads per acre, which heavy labor renders the use of lime more economical, although carried from a greater distance, except in cases where the chief object is to loosen very stiff clays, on which it acts with considerable effect.

The origin of earth-marl is a subject of curious inquiry. It is an object, however, of only secondary importance to farmers; but we refer those who feel interested in it to an ingenious treatise, which may be found in the Appendix to Holland's Survey of Cheshire.* Those kinds of which we are now treating are often found at the base of chalk hills, or in the valleys formed between them, and have probably arisen from the chalk which has been washed down by the rains, together with the vegetable and animal matter of various descriptions which collect and combine together; for, on analyzing them, they are found to contain clay, sand, loam, and chalk, and in proportion to the quantity of other substances with which they are combined, they are either saponaceous and clammy, or crumble if largely mixed with calx. Earthy marls are, however, found in beds of such distinct substance, that a body of sandy marl has been known with a regular bed of limestone under it, and a stratum of clay-marl under that; in which case it is evident that the clay at the bottom, if it was not the native soil, must have formerly formed some part of the hill towards its base. The color of marl is thus occasioned by the nature of the mixtures of which it is composed; for pure calx, or chalk, being white, necessarily imparts a similar hue in proportion to the quantity of calcareous matter which it contains; while the red tinge so perceptible in much of the clay-marl is a strong evidence of the existence of iron. There is also a sort of clay which, from its soapiness, is often mistaken for marl, though differing essentially in its requisite properties. This earth appears to be impregnated with sulphur, and other mineral substances injurious to vegetation, which renders it expedient that farmers who are not already well acquainted with its nature should either use it at first cautiously, or have it carefully analyzed by some competent chemist.†

cent. of sand, consequently chalk and sand are the predominant ingredients. Kirwan on Manures, p. 13.

The analysis made by Von Thaër, of a quantity dug out of pits at Oldenburgh, in Germany, showed it to contain in 100 parts

Of fine sand - - - - -	36
Clay of a soapy kind - - -	44
Mould - - - - - -	5
Carbonate of lime - - - -	14
Gypsum - - - - - -	1

—*Principes Raisonnés d'Agriculture*, 2de ed. tom. xi. p. 423.

* On the nature and origin of marl, by J. J. Stanley, F. R. and A. S.

† See Malcolm's Compendium of Husbandry: Anal. of Main., vol. ii. p. 70—85.

Shell-marl.

Shell-marl is usually of a bluish color, soft to the touch, and somewhat resembling potters' earth; but when exposed to the air it crumbles, and falls into a powder, nearly in the same manner as lime does in slaking.

The nature of this marl is very different from those of earth or stone; for it contains both stimulant and fertilizing properties which do not belong to the former, and from its effects upon the soil it has been classed among animal manures, though it more properly resembles a compost formed of earth and lime, with animal and vegetable substances, for which reason it is justly considered preferable to the others. It exists at the bottom of most lakes, and under bogs and morasses, or other pieces of stagnant water which have been drained, and might, no doubt, be found in every place where water has originally rested; though, as it is usually under other layers of earth or peat, its depth below the surface is often too great to admit of its being searched for with advantage. Every farmer should, therefore, carefully examine the sides and bottoms of his ditches and ponds, for, by doing so, he may often find appearances of marl in places where it was not suspected, and large beds of the most valuable sort have been in that manner discovered, which might have remained unnoticed for years.*

It is chiefly composed of those myriads of small shell-fish which, with other fry and insects, usually procreate wherever there are pools of water, and the remains of which have, in the course of past ages, been deposited along with sand and decayed vegetables, or other matter swept from eminences, or by the decomposition of aquatic plants. This process of alluvion has, in the lapse of time produced those masses of shell-marl which display the most striking effects when employed as manure; for the shells, when decomposed, are converted into lime of such purity, that some moss-marl, examined by Dr. Coventry, was found to contain 84 per cent. of pure chalk—which is more than is generally possessed by the purest lime—and the mould formed of the other substances must be very rich.† It may, therefore be converted into quick-lime, by burning, or it may be used in its natural state; but then it is not so minutely divisible, nor so soluble in water, and is of course, more tardy in its operation; its effects, however, continue longer, and it is apparent that, as it contains more calcareous matter than the common qualities of lime, it may be used in smaller qualities. When spread upon grass, or clover, it is found to promote the growth of the herbage, for it partakes of the nature of pounded limestone, and possessing none of the caustic properties of

* Malcolm's Compendium of Husbandry, vol. ii. p. 85.

† Farmer's Mag., vol. iv. p. 156. By other experiments made by Sir G. Mackenzie (ib. vol. v., p. 271,) it appeared that some shell-marl was composed of

Lime - - - -	41 25	in 100 parts.
Carbonic acid - -	32	
Silex - - - -	14	
Argil - - - -	4	
Oxide of iron - -	2 5	
Inflammable matter -	2	
Loss - - - -	4 70	

quick-lime, it may be used without hazard as a top-dressing. It also occasions heavy tillage crops; and if the land be not over-cropped before it is returned to pasture, the turf is found to be closer, more plentiful, and sweeter than before; but on cold damp soils, which have been heavily worked, the crops of grain have proved later, and the corn lighter than on land which has been limed.*

Marl pits.

The common mode of searching for this, and every other kind of marl, is, by the boring-irons used in seeking coal, and other mineral substances. It may, however, be easily effected by any farmer who has reason to suspect its existence on his own land, by using a long pole, furnished with an iron auger fixed at its end; but if this does not reach the marl within about twenty feet below the surface, the sinking of pits, unless the quality be very superior, will seldom be found to answer the purpose. The pit is usually opened by digging a ditch of four to six feet broad, by twelve to twenty long, the surface earth being generally thrown on one side, and of the sub-soil, or virgin earth, on the other. The marl is then extracted in square pieces with a small cutting spade, either to its full depth, or to that to which it can be taken without danger; for care must be observed in preventing it from falling in, by which serious accidents have very frequently happened. The pit is then either so far filled up as it will allow, with the clay rubbish, or other earth of the sub-soil, covered by that of the surface; and if it be not of great depth, it may, with a little attention, be easily brought to a level with the rest of the field: if not, it is in other places formed into ponds; but in that case, or if left in open pits, the precaution should be observed, of either fencing them round, or sloping their sides, so as to guard against accidents.

In those places where marling is regularly carried on throughout the year, it is generally managed by persons who make it their sole business; but when the farmer's teams must be employed, it can be only done from the latter part of autumn until the commencement of the spring sowing, or during the intervals of other work, though it may be carted upon the land at all times which may be found convenient. The expense depends upon a great variety of circumstances, but chiefly upon the depth from which the marl is dug, and the distance to which it is to be carried. The nature of the surface-soil, and the charge of removing it —the tenacity of the marl, and the quantity of water with which it may be covered—all vary according to the locality: then the carriage, particularly of clay-marl, is so heavy, that unless it can be found nearly adjoining the farm, it will rarely pay the cost of removal; for the work is so severe that, even in the slack time of winter, the cattle will require better food than is usual at that season, and the wear and tear is also considerable. All weighty considerations, which, when compared with the tenure of the land, deserve mature consideration before the improvement be attempted.†

Tenants should, therefore, be cautious how they undertake it, unless backed either by the security of a long lease, or by entire confidence in the estimation of their landlord; for a very considerable period may elapse before it incorporates with the soil, and, consequently, before any benefit can be received from it. Of which, that able farmer Mr. Macro, of Suffolk, gives an instance, in 120 square yards having been laid upon some very poor soil at an expense that would have purchased the fee simple of the land; yet no visible improvement was effected in comparison with other ground which had not been marled, until very long afterwards, but then it evidently obtained an advantage, which it maintained after a lapse of twenty years.†.

[To be continued.]

From the Genesee Farmer.

LAMPAS OF HORSES.

As the season of the year is now approaching, when some people commence one of the most cruel and barbarous practices ever retained by any people, pretending to be civilized—viz: that of burning out the lampas from the mouths of young horses, we cannot refrain from making a few remarks upon that subject.

We are sensible, that some of our most enlightened readers, will say that this article should appear under the head of *vulgar errors;* but yet we have what we consider a reasonable excuse for not putting it there. Most of the articles which have been placed under that head, in our paper, are rather innocent delusions, than partaking of the barbarous; rather superstitious rites and ceremonies, appertaining to property, than any retained usages of the dark ages of barbarity. At what time or with what people this practice originated, we will not pretend to say; but there is one nation, who should either discontinue the practice, or else say less of the general diffusion of useful information; *that is America.*

The idea that the enlargement of that part of the roof of a horse's mouth, is a disease, has long been exploded by all veterinary surgeons. All horses are subject to it, between the ages of three

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* Reports of Roxburghshire, p. 135. Forfarshire, p. 407.

† The price of good marl, when raised by contractors, is charged at such various prices in different places, that we should probably mislead some of our readers if we were to state them. It is computed at separate sums for groundage, digging, and spreading upon the land; but independent of the cost of carriage, which is to be added. We may, however, observe that, when taken from the wastes or commons, it is the practice of some landlords to charge 5s. an acre for the land marled; others 2d. per farm-horse load; and in some parts of the north the expense has been thus calculated: paring the marl, say of 3 feet of superficial soil, 12s. per cubic rood of 64 yards; getting and filling the marl, 12s.; loading it, supposing the pit to be at the distance of 100 or 150 yards, 21s.; and spreading, 4s. per rood.—Cheshire Report. p. 223; Stevenson's Lancashire, p. 496. In Hampshire, the total charge of marling, when done by the farmer's men and teams, at an average distance of 80 rods from the pit, is stated at £3 10s. per acre, presuming the quanty laid on to be 30 cart-loads of 1½ ton each; that is, taking cammon laborers at 2s., and horses, including wear and tear, at 4s. per day.—Vancouver's Hants, p. 337.

† Annals of Agriculture, vol. i. p. 286.

and five, more or less; and in many cases, this soft spongy enlargement, descends to a level with the fore teeth, yet upon examining it, there will not be found any marks of tenderness or inflammation indicating disease; and if left to the operations of nature will disappear, and the horse will have a sound and healthy mouth. Not to speak of the danger of bleeding the horse too freely, by opening the palatine artery, the manner of performing the operation, is shocking to the feelings of humanity, as well as painful to the animal. It is uncalled for, and must be considered a piece of wanton cruelty.

From the Fredonia Courier.

FRENCH HAY.

Many of our readers, at least, will be surprised to learn that hay from France has been imported into this country. A cargo lately arrived at Charleston, (S. C.) and sold for $1 62 per hundred. A cargo of American hay, which arrived about the same time, from Portland, (Me.) sold for $2 per hundred.

From the New England Farmer.

BEET ROOT SUGAR.

It is stated in papers in the northern parts of France that large orders have arrived from the United States for supplies of beet root sugar.

FACTS AND ESTIMATES RESPECTING BEET SUGAR.

To the Editor of the Farmers' Register.

Columbia, S. C., July 1, 1836.

In the February No., 1836, of the *Journal des Connaissances Usuelles*, for which I subscribe with much satisfaction, I find an analysis of a treatise on Beet Sugar, by M. Mathieu Dombasle, 1836, *chez Huzard a Paris*, 1836, *prix* 1 1-2 *franc.*, 2nd edition.

The facts, in brief, are these:

1000 kiliogrammes of beet root, will yield, to a careful manufacturer, 6 per cent of good merchantable brown sugar, or 60 kiliogrammes: which can be refined into excellent loaf sugar by the usual process.

1000 kiliogrammes of beets can be purchased by the manufacturer for 16 francs.

By careful and accurate analysis,, 10 per cent of such sugar can be extracted from beets; but six per cent is the usual quantity, and improvements are contemplated that may produce 8 per cent.

The expense of manufacturing 1000 kiliogrammes of sugar from beet root, is calculated at 12 francs.

The residue is worth 3 or 4 francs as food for cattle.

Put this into English.

A kiliogramme is 2 1-5 lbs. averdupois: 1000 kiliogrammes will amount to 2200 lbs.: and 60 kiliogrammes to 132 lbs. averdupois.

A franc, in merchants' accounts, here in America, is calculated at 20 cents, though hardly worth 19.

A sous is the 20th part of a franc, or one cent; or one half penny English. The cost of beet root and of manipulation for 132 lbs. of brown sugar, will be 28 francs: from which, deduct 3 for the residue, and there will remain 25 francs, or 500 cents, the price at which 132 lbs. of sugar can be manufactured, not quite 4 cents per lb.

The French reviewer of the book, calculates the expense at 5 sous per lb. French, which is either 7561 grains English to the lb., or 7717 grains, for both these numbers are found on good authority. The latter I take from Kelly's Cambist. The English lb. averdupois is 7000 grains; hence, there is but little variance between my calculation and that of the French author.

I confess I was astounded at these facts. Sugar from beets at 5 cents per 112 lbs., when cane sugar is nearly three times the price to the consumer in this country.

As to the value of the beets. I think we could afford them as cheap here. I am sure they could be raised for less in the confines of New York and Pennsylvania, where they grow with very great luxuriance.

I lived some years a mile and a half from Altringham in Cheshire, (England.) At Altringham, (a sand hill,) they grow carrots thus. They manure at the rate of 10 lbs. sterling per acre, every 3 or 4 years, purchasing horse manure at 4s. 6d. per three horse load at Manchester. They haul the dung ten miles. They plough with 4 horses as deep as possible. They sow their carrot seed by rubbing together one-third carrot seed, and two-thirds sand, broadcast. They hoe with a ten-inch hoe, leaving the roots about a foot apart. They get from 12 to 16 tons per acre. Arthur Young somewhere talks of 19 tons of carrots per acre. I used to buy them laid down at my door at 4s. 2d. per 250 lbs. weight, not washed. I fed my horses chiefly with carrots, when they were in season.

Pray think a little on these facts. Has not every farmer on rich, light land, a sugar plantation at his door?

THOMAS COOPER, M. D.

For the Farmers' Register.

NOTICES OF THE SEASONS IN OLDEN TIMES.

The extraordinary winter which has not long since left us, has caused me to examine into the state of the seasons and weather at the earliest periods of our history. It has long been the opinion of the writer, from facts gathered from the different histories of the country, that the common idea about a permanent change of our climate from cold to a warmer temperature, is a mistaken one. I will not undertake to say, that the clearing up of the woodlands of the country, and the draining of immense swamps and marshes, have no effect in the average temperature. But it seems to me, that proof is wanted to substantiate such a position. It is probable, that no one doubts, that the climate is improved in health by the clearing and draining of the country. Until within five or six years, very few, it seemed to me, doubted that the climate of our country was moderating, and had been gradually moderating in temperature, from the first settlement of the country. Is this so? I do

not, for one, believe in the opinion, but will give facts as stated by our historians, and let every one form his own opinion. In referring to these, it will be more interesting to give extracts, and not to be studious about a logical arrangement of matters. Let us proceed and see if the weather 200 years ago was not, for a series of years, about the same kind of weather which we have had for the last 25 years. The following account of our climate about the year 1608, is given by Smith. The first permanent settlement of Virginia was in 1607. "The summer is hot as in Spain: the winter cold as in France or England. The heat of summer is in June, July and August, but commonly the cool breezes assuage the vehemency of the heat. The chief of winter is half December, January, February, and half March. The cold is extreme sharp, but here the proverb is true, that no extreme long continueth.

In the year 1607 was an extraordinary frost in most of Europe, and this frost was found as extreme in Virginia. But the next year for 8 or 10 days of ill weather, other 14 days would be as summer."—*Smith.*

This winter (1607) was extremely cold in Virginia, and it was likewise remarkable for an extraordinary frost in Europe.—(Stith's History.) This was the winter in which Capt. Smith was taken prisoner in a swamp on the Chickahominy, by Opechancanough.

This winter (1607) is noticed in the life of Gorges, to have been dreadfully severe in New England.—(Belknap's Life of Sir F. Gorges.)

It may not be uninteresting to remark here, that the year 1607 was a year in which Halley's comet returned, in its revolution of about 75 years. The appearance of the same comet last fall, was the third appearance since 1607. The same comet appeared in 1682. On the 11th December, 1681, the Delaware river froze over at Chester; yet Wm. Penn, in a letter written in 1683, says that the winter of 1681—1682, was mild, scarce any ice at all. The winter of 1682—1683, was his first winter in Pennsylvania, and he says it was the coldest the oldest liver in the province could remember. "From December to the beginning of March, we had sharp, frosty weather—a sky as clear as in summer, and the air dry, cold, piercing and hungry." He intimates that the great Delaware was frozen up for a few days; but he does not speak of extraordinary cold weather. (Mr. Penn's letter to Free Society of Traders.) I find but few notices of the winter of 1759, the next appearance of Halley's comet. On the 6th December, 1758, the weather was cold and the ice run violently in the river at Pittsburg—it snowed—22nd, cold and stormy—27th, it snowed the whole day—28th, do. 3rd January, 1759, it snowed, freezed and rained—9th January, the Susquehannah was crossed on the ice.—(Journal of C. F. Post, 1758—9.)

The winters of 1779—80, 1782, 1791, were very severe in Virginia. It is asserted by Burk in the 1st chapter of his history of Virginia, that it is known by actual observation and experiment, that the climate of Virginia has perceptibly changed within the last 30 years. The winters are neither so long or severe as formerly, and there is a proportional abatement in the heat. He undertakes to state the causes of the supposed change of climate. This was written about 1804. Now it seems to me if Burk had experienced our climate since 1829, he would not have entertained longer, or hazarded such opinions. It seems to me, that this alleged change of our climate is altogether ideal, and has no foundation in fact. Judging from historical data, we have in these days the same kind of seasons experienced here 230 years ago. Some winters were uncommonly cold—some very moderate. So has it been of late years. But so far from the winters being shorter and less severe than formerly, I do not believe it can be shewn by recorded facts, or by the memory of man, that there ever was before in this State, a succession of such severe winters as have occurred since 1829. I can find a record of no such winter as the past. By referring to the recorded facts in other States relative to the climate, we find the same evidence as to the similarity of the seasons many years ago, and for a few years past. We find it stated in Pennsylvania in 1760, that the winters there were longer and more severe than in England—the summers hotter and dryer—the springs very short—the autumns long and mild. The snows are frequently very deep in winter, and the frosts so intense, that it has not been very uncommon for the large river Delaware, even where it is near a mile broad, to be frozen over in one night so as to bear people walking on the ice in the morning—which river sometimes in the winter season for several weeks together, even opposite Philadelphia, is as much frequented with loaded carriages as any part of *terra firma.* They had their warm winters at that remote period, as well as cold ones, and the following account of the weather in Pennsylvania written in 1729, more than 100 years ago, although written in poetical language, is doubtless accurate. It was written in Philadelphia by Thomas Makin.

"Yet oft tho' warm and fair the day begun,
Cold storms arise before the setting sun,
Nay oft so quick the change, so great its power,
As summer's heat and winter in an hour!
So violent the wind, that oft the ground
With rooted trees is covered wide and round;
Sometimes the ice so strong and firm is found,
That wagons pass as on the solid ground,
But yet so temperate are some winters here,
That in the streams no icy chains appear,
And all the season boats and shipping may
With oar and sail divide the liquid way:
So various and uncertain is the clime,
For heat and cold extreme in little time."

Such being an account of the seasons 100 years ago in Pennsylvania, it seems not difficult to form an opinion as to the alleged change of climate, from our own knowledge of the climate the last few years.

Samuel Williams, a very able man and formerly Professor of Natural Philosophy in Harvard College, takes, in his History of Vermont, the same ground as Burk, relative to a change of climate. This dissertation on climate is long and learned, and contains some tables of meteorological observations made by the Doctor himself in Rutland, Vermont, in 1789—90—91. The greatest height of Farenheit's thermometer during that period, in latitude 43 degrees 36 minutes, was 93½ degrees. The least was 27 below 0. The mean heat was 43½ degrees from all the observations. The temperature of the water in deep wells in the same

place, without variation in summer or winter, was the same 43½ degrees.

Dr. Williams wrote his history about 1794, and he says "the cold of the winters decreases—the rivers are not frozen so soon—so thick or so long, as they formerly were. A remarkable change of this kind has been observed in all the settled parts of North America. The bays and rivers in New England are not frozen so hard or so long as they were at the first settlement of the country. At the first settlement of Philadelphia, the river Delaware was commonly covered with ice about the middle of November, old style. It is not now covered with ice till the middle of January." Dr. Williams for the last assertion, refers to Kalm's Travels. Kalm travelled in Pennsylvania about that period, and the Delaware might on one or two occasions have been covered with ice about the middle of November; but the assertion in its broad sense is evidently incorrect. We consider the account given by Penn at the very period, and on the spot, and the account given by Makin in 1729, 46 years afterwards, as much more entitled to credit than the researches of a passing traveller. It is well known, that for the first 150 years or more after the settlement of this country, no particular or minute accounts of the weather appear to have been kept. It is very certain, that notices of the climate, or weather, anterior to 1750, are exceedingly scanty. But scanty as they are, they furnish strong if not conclusive evidence, that the major part of the winters for the first 150 years after the settlement of the country were moderate, equally so as the winters of modern times. After the extremely severe winter of 1607, we find very rare notices of severe winters up to the commencement of the present century—mild winters would of course pass without recorded notice. Immediately succeeding 1607, it is fair to infer, that for many years the winters were mild—it is fair to draw such an inference from a perusal of the events and circumstances of those periods, and in the absence of all notice of severe weather.

Kalm travelled in this country in 1749. It was from the *old* Germans in Pennsylvania, that he derived the information of the change in the winter seasons, from cold to more moderate. And the ancient people at Quebec, in 1749, informed him that the winters in Canada were formerly much colder than they *then were*. The Baron Lubantar put to sea from Quebec the 20th November, new style, in 1690, the like of which he says was never seen before in that place; yet we well know, that at that period it was impossible to obtain information at Quebec of the actual state of the climate there, for many years anterior to 1690. In 1794, Dr. Williams says that the St. Lawrence is *now*, not frozen over till the latter end of December or beginning of January. If Dr. Williams had experienced the last six winters, it can hardly be doubted, that he would have changed his opinion as to the gradual moderating of our winters.

We have satisfactory evidence, that the information given to Kalm in 1749, that the Delaware was formerly frozen over by the middle of November, is wholly devoid of foundation. The following notices from the gazettes of the periods, were collected by Samuel Harvard, Esq. They are interesting, and do not occupy much space. I give, however, only a few—such as are conclusive to prove the incorrectness of the information given to Kalm.

1681, December 11th. The Delaware froze over that night. 1704. Snow fell one yard deep.

1714, February. Flowers seen in the woods.

1720, December 20. Our river is full of ice 27th December. The river is now clear of ice.

1721. The river is full of ice. 26th December. The river is locked up. January, 1722. Vessels get up to New Castle. February 6. Vessels cleared and entered.

1723, January 1st. Weather is yet moderate and our river open. 6th, do.—and free from ice. December, same year. Vessels enter and clear through the month. 1724, January 18th. River free from ice. December 22. River full of ice. 29. Some driving ice. 1725, 3rd March. A snow 2 feet deep, which had not been known or some years. 1725, December 21. River full of ice, but not closed.

1726, January 18. Entries and clearances. December. Do. through the month. 1727, February 14. River not closed. 1728, 23rd January. River frozen up—very hard weather for a fortnight previous. December 31st. 36 vessels, &c. frozen up at docks. 1724, Feb. 17. Entries and clearances. Dec. Do. through the month. 20th Jan. 1730. A very deep snow—river full of ice. 27th Jan. A vessel cleared. Dec. 29th. Entries and clearances.

1731, December 14th. River full of ice. 21. River a little opened. 1732, December. Entries and clearances. 1733, January 18. Great snow at Lewes. December. Entries and clearances. 1734, January 1st. River continues open, and even then very moderate—winter hitherto as moderate as for many years past. December. River free from ice—weather fine and open.

1735, 16th January. River open and weather very moderate. December. Entries and clearances. 1736. 6th January. River is fast and full of ice. February 5th. Arrivals. 25th. Two whales killed at Cape May. December. Arrivals and clearances through the month.

1737, January 20th. Weather very cold—persons frozen to death—river frozen up. December. Entries and clearances through the month; also through January and February, 1838. December, do., till the 18th. 1739, 25th January. River clear of ice. December. Entries and clearances. 1740, January 10. No entries, &c. till 21st February. March 15th. Ice broken up in the Delaware. December 19th. River frozen up till 13th March. From Lewes it is all ice towards the sea as far as the eye can reach. Tuesday and Wednesday are thought to have been the coldest days for many years.

5th March. The severity of the winter complained of throughout the country—cattle dying from want of fodder—many deer found dead in the woods, and some came tamely to the plantations, and fed on hay with other creatures. 13th March. River navigable—the winter extremely long and severe. 19th. River now quite open—vessels daily come up.

April 19th. We hear from Lancaster county, that during the great snow, which in general was more than 3 feet deep, the black inhabitants suffered much for want of bread, &c. &c. The Indians fear a scarcity of deer and turkeys. December. Entries and clearances. 1742, January. Do. 22nd. Comet visible for some time. Feb-

ruary and March. Entries, &c. December. Do. No mention of ice. January, 1743. Do. 1744, 3rd January. River full of ice. 19th. Arrivals. December. Entries and clearances. 1745, January, February, March, and December. Entries and clearances—no mention of ice.

1746, 28th December. River frozen up for a week. 1747, February 24th. First arrivals since 22nd December. December 15. River full of ice. 1748, January 12th. Entries and clearances. December. Do. Through the month.

So much for the information of the old German inhabitants to Kalm. The above notices are from actual data printed at the times specified. There is not a single instance noted of the river being frozen up in November, and but few instances in the month of December. Here are authentic notices of the climate of the Pennsylvania winters, as far back as 1681, 70 years anterior to the visit of Kalm. Philadelphia was then a wilderness, and no permanent settlement had been made in Pennsylvania, on the Delaware, except at Chester in 1675.

There is abundant reason to believe, that the accounts given in other States of the great severity of the winters in olden times, are equally devoid of correctness. It is probable the moderate winters were forgotten, and the very cold ones made a lasting impression on the memory. We know, that in ancient history, we have no record of consequence of events in times of *peace;* we read only of *wars.*

Mr. Jefferson in his Notes on Virginia, written in 1781, refers to the change of climates, &c. and seems to agree with what is said by Dr. Williams and others.

He says: "A change in our climate, however, is taking place very sensibly. Both heats and colds are become much more moderate, *within the memory of even the middle-aged.*" Now those who have experienced the cold of the last few winters, and the heat of the summer of 1834, will not hesitate to believe, that Mr. Jefferson and the middle-aged of that period, drew wrong conclusions, and if now alive, would not entertain such notions. He speaks of the long and cold winters of olden times, on the authority of the *elderly,* and they were as much mistaken, it seems to me, as the old Germans who undertook to inform Kalm. "Snows are less frequent (in 1781) and less deep. They do not often lie, below the mountains, more than one, two, or three days, and very rarely a week." They are remembered to have been formerly frequent, deep, and of long continuance. The elderly inform me, the earth used to be covered with snow about *three months* in the year. The rivers which then seldom failed to freeze over in the course of the winter, scarcely ever do so now." —*Jef. Notes.*

In remarking on these observations, it will be evident to all, that Mr. Jefferson in 1781 describes a milder climate, much, than we have experienced of late years. We have had more freezes and more snows which continued for moderate periods, than he describes. But *when* were those winters with deep snows, and of long continuance—with the earth covered with snow about *three months in the year?* In 1781, the *elderly* speak of them. Their memories are proven to have been faulty by recorded facts. We have seen that, at the first settlement of the country, the winter of 1607 was excessively severe here and in Europe. We have Smith's history from that period to about 1630. During that period, he mentions no other severe winter, and it is clear from his detail of events, movements and operations, that they had during that period none of the long freezes and snows spoken of by the elderly in 1781. It is true we find but few notices of the weather, earlier than the notices aforesaid, commencing with 1681. But it can hardly be doubted, we should have had them, if instances of extraordinary severity had occurred. We think it also fairly inferable, that those winters of three months snow, never had an existence here, from the facts, that the events described in our history could not well, if at all, have happened, if such had been the weather. From 1681, we know such winters had no such existence here, except, perhaps, the winter of 1741 and 1780. We can fairly say we know this, because if no such winters happened as far north as Pennsylvania, no one can believe they happened here. We have brought the notices down to 1749. By referring to the diary after that period, we find that the weather for the next 30 years up to 1781, was very similar to those years noticed above. There was but one winter of three months cold weather in Pennsylvania, and that was 1780. The Delaware was not generally, and in fact but rarely frozen over in the month of December. It may not, however, be amiss to remark that from the recorded notices of the weather before referred to, there seems to have been more cold winters from 1750 to 1780, than from 1720 to 1750. On the whole, it seems that there is not proof, that the winters, one or two hundred years ago, were generally colder than the winters since 1800. An examination of the recorded notices of the winters up to the present time, will clearly show, that the winters have become neither milder or shorter than they were at the first settlement of the country.

The want of leisure, at present, prevents me from referring particularly to meteorological tables to substantiate the view above taken. Bnt there is little doubt, that such tables, for the last 80 years, would show that there has been no abatement in the average temperature. Perhaps the subject may be resumed hereafter. The subject, of what winds were most prevalent on this continent 200 years ago, would also afford much curious speculation, and would doubtless be interesting. For the last few years, many have been the complaints that the easterly winds had much increased of *late years.* It will be found on examination, that precisely the same complaints were made sixty, if not 100 years ago. S.

From the Cultivator.

BEET SUGAR

We have received a communication from a friend, soliciting our co-operation with the friends of improvement in Pennsylvania, in furthering the culture of the beet, and the manufacture of sugar from this root. Some gentlemen in Philadelphia, impressed with the importance of the subject, have patriotically sent Mr. James Pedder to France to acquire the knowledge requisite to the culture and manufacture. Our correspondent says, "I have seen samples of the sugar made from the beet root, equal to the finest loaf I ever saw, and

which only cost nine cents per pound in France. When I return, I will furnish you with the sample. France last year manufactured eighty millions pounds."

Had our correspondent examined our last volume, he would have seen that we had anticipated his request. At the suggestion of a correspondent in the far west, we gave a summary of the mode of culture and manufacture, from M. Chaptal, than whom no one was more competent to instruct, as he conducted the business on a large scale for twelve years, and was withal, one of the best chemists of the age. This summary will be found in pages 85, 86 and 114.—The whole process is minutely detailed in Chaptal's "Chemistry applied to Agriculture." We stated that beet sugar could be successfully cultivated in France, when foreign sugar did not compete with it in the market at a less price than ten cents per pound. We did not then consider, nor did our readers probably understand, that the remark then had reference to *refined* sugar. The fact now seems to be this, that beet sugar, equal to our double refined loaf, which now sells in the New-York market at eighteen and twenty cents per pound, can be profitably sold in France, by the producer, at nine cents per pound, or at half the price of cane sugar. It follows as a matter of course, for bating the difference in labor, we *can* produce it here as cheap as they can in France, that the culture of the beet, and the manufacture of beet sugar, can be rendered *a profitable business* in this country. Our soil and climate are well adapted to the beet; and in the interior, in particular where the price of foreign sugar is enhanced by the charges of transportation, beet sugar must ere long be among the staple products. As an offset to the difference in labor, we have an advantage in the cheapness of land. Chaptal's estimates are predicated on a rent of 40 francs ($7.60) per acre.

Chaptal states his average product in beet roots at 40,000 pounds the hectare (which is 2 acres 1 rood 35 perches English); that in his establishment he operated upon 10,000 pounds in a day; that this quantity (10,000 lbs. roots) produced of

1 Refined sugar, 187 lbs. worth	- - - - - -	210	francs.
2 Middling do. 67 lbs. worth	- - - - - -	67	" 50 c.
3 Trimmings, 1,000 kilogrammes, (fed) worth		2	" 50 c.
4 Mash, (fed to stock) 1,250, worth	- - - -	30	"
5 Molasses, 130, worth	- - - - - - - - -	12	"
		322	francs.

equal to about $61 on the products of one-fourth of a hectare, or something more than half an acre of land. The expense of cultivating an acre is stated at 133 francs, about $25, which includes 40 fr. for rent, and 10 for taxes, and leaves about $15.75 for cultivating, digging, transporting and storing the crop. He states the expense of cultivating and manufacturing 10,000 lbs. roots, including all charges, at 192 francs, about 36 dollars, leaving as a profit on this quantity of roots, about $25, say $35 the acre, clear profit. Upon 1,200,000 lbs. of roots, the average produce of three hectares, he estimates a nett profit to the manufacturer, after deducting interest on capital, repairs, &c., of 6.650 francs, about $1,260.

After penning the above, we received the interesting letter of M. Le Ray de Chaumont, which will be found under the head of correspondence, showing the importance of beet sugar as a household manufacture.

ANTICIPATED CHANGE IN THE AGRICULTURE OF THE UNITED STATES.—SILK, AND BEET SUGAR.

Some considerable time has now passed since we yielded, slowly and with difficulty, to the belief, that the introduction of silk culture in this country would be extended widely and profitably: and since adopting that opinion, we have made continually repeated efforts to impress on the people of Virginia, and the other southern states, the superiority of their facilities—in better climate, cheaper land, and surplus and now expensive hands—for carrying on this new business, over those of our northern countrymen, who have already proved the advantages to be derived, and are investing large capitals in numerous adventures for this object. In New England, where most of these efforts are making, there is no superfluity of labor. Fortunately, every poor female, and all persons infirm from either tender or advanced age, may be, and annually are, employed profitably, according to their measure of bodily power. Yet still it is considered profitable to *divert* much of this labor to the silk business: and that too, in a climate so rigorous that artificial heat must be used frequently in rearing the worms, and the best kinds of mulberries are often greatly injured, if not killed to the ground, by such severe winters as the last. In Virginia, there is no difficulty as to climate—thousands of now unemployed and expensive hands might be given to the work—and lands, now unprofitable or neglected, and at very low prices, would serve as well for planting, as those selling ten or twenty times as high in New England. Putting all views of greater pecuniary profits aside, if the silk culture could be established in Virginia, without any absolute loss to the undertakers, a great moral and political benefit would be gained, in giving the bread of independence, and of honest labor, to thousands of destitute females, who have now no resource but to live on the charity of others, or to starve on their own ill-paid labor of the needle.

Another new kind of industry now seems likely to be introduced, and established with profit—and which, in a different manner, offers great benefit to the agriculture of a large portion of the United States. This is the making of sugar from beets. We readily confess, that until very recently, we considered this scheme worthless, and absurd in every country that could freely import sugar produced from the cane—and that this species of industry, which could not be established by the iron despotism of Napoleon, and the protection afforded by his "continental system," could not exist in times of peace and of comparatively free trade. But we have been forced to yield the opinion to such facts as are presented in the letter of Professor Cooper, and other pieces in this No. which are but specimens of many that have recently appeared. If, as seems to be undeniable, beet sugar can be made cheaper than that of the cane can be bought, there is an end of all question and doubt as to profit. There is also an agricultural benefit to be expected from the new culture of beets, for sugar, that is very important, and that is an addition to all the pecuniary profit expected from the sale of sugar, and the profits of live stock fed on the

pulp left after the saccharine matter has been expressed. This is the introduction in our farming of what is so greatly needed, an increased extent of culture of roots, or green and meliorating crops, to take the place of our too extensive grain culture. The culture of beets for sugar, and the use of the pulp as food for cattle, must necessarily make the rotation of crops more mild, and add greatly to the improvement of the soil—and by this means, would ultimately add very far more to the fertility and wealth of a country, than as much grain culture, even though the pecuniary profits to the farmer, at first, might be no more. The same important consideration applies also, though in a different manner, to silk culture. Thus it may well happen, that the introduction of these two new kinds of culture, even though not attended with greater pecuniary profits, (or not much greater,) at first, would be productive ultimately of far greater to each individual farmer, as well as of greater moral and political benefits to the nation.

This important consideration of the advantage of beet culture to a rotation of crops, is properly appreciated in France. The latest French article on the subject that we have seen is from the pen of M. Soulange Bodin, and appeared in the *Annales de l'Agriculture Francaise* for April, 1836. We offer a translation of a passage on this head.

"The Viscount Morel de Vinde, in these Memoirs, has then presented the sugar beet as being the best, or rather the *only kind* of tilled plants which, in the four-shift rotation can usefully be substituted for the year of naked fallow [to prepare for wheat;] and he thus *considers as connected the universal perfection of our agriculture, with the manufacture itself of sugar from beets:* a manufacture which, by its indefinite extension, and demand continually renewed, ought to give greater encouragement to the culture of this plant, which is susceptible of having, from this moment, a general use, and a certain sale. Indeed, he says, the [making perfect the] four-shift rotation, consists in finding a plant that is not exhausting to the soil—of which the tillage is confined to one year, and serves well to cleanse and to pulverize the soil—and of which the products, not yielding a kind of food for men before indigenous, or belonging to the country, shall however be in general use, and command a certain and ready sale. The beet, applied to the making of sugar, fulfils perfectly the conditions of this problem." * * * "It may also be observed, that the plant which by the production of this sugar, renders possible the universal improvement of agriculture, furnishes besides, by its remains, [as food] the best of all manures from cattle. This plant fulfils so completely all the conditions required from tillage crops, that it *would be necessary to substitute it for the naked fallows, even though it should not yield otherwise* [*and at first*] *such rich or important products.*"

In a report of the Council of Agriculture, Manufactures and Commerce, which was also published in the *Annales*, it is stated by the Minister of Commerce (presiding at the meeting) that the manufactories of France in 1835, yielded 25 millions of kilogrammes of beet sugar, of the value of 35 francs the quintal, which is equal to one-third of the annual consumption of the kingdom; that 50,000 hectares of land were then subjected to the culture of the plant; and that in those parts of France where the culture was established on a large scale, the value of the lands had been increased, and in many cases even had been doubled.

According to the present imperfect lights on this subject, we fear that the beet culture will not suit a region so warm in Eastern Virginia. But its introduction will be a benefit sufficiently important, even if confined to the regions lying more north and west. It is probable that the fanaticism of the "abolitionists" may be mingled with the motives to spread this culture in the north—and that one of the results may be an effort to lessen the consumption of sugar from the cane, as being a product of slave-labor. Be it so. This fanaticism cannot exert any part of its tremendous force more harmlessly to the south, or more beneficially to the north, than in promoting the extension of this new culture.

From the Northampton Courier.

SOIL AND CLIMATE FOR THE SUGAR BEET.

A friend who is conversant with the cultivation of the beet root in France, has furnished us with the following interesting outlines.

Of the seven varieties of the beet root usually cultivated, the *white* (beta alba) is preferred by the experienced manufacturer, as it is found to contain a larger proportion of the saccharine matter to a given weight of the root, than any of the others. Though this plant will grow in almost any soil, it prefers a deep loose loam, in which its long and tender fibres may penetrate and the root devolope itself without obstacle. It follows that a stiff compact soil should be avoided, and still more a low damp situation, where the root becomes so impregnated with aqueous parts, that the difficulty and expense of separating these would in most cases be far from remunerated by the produce. In high ground the beet succeeds well, if the season is not too dry, and in these situations (ceteris paribus) is more productive in sugar than elsewhere.

As to climate, a northern latitude is found to suit this plant best: the north of Germany, Prussia and Silesia, the countries where this new application of it was first made, are more favorable to it than even the northern departments of France, as experiment has amply established, and the trial of it in the south of France has constantly failed, though it was at first supposed that this root, favored by the genial sun of that climate, would, as well as its other productions, contain a larger proportion of the saccharine principle than those of colder countries. This hypothesis, founded on a mistaken analogy supposed to exist between plants growing above and below the soil, proved, as might have been expected, completely fallacious, and the culture there is now given up.

THE MARLY, OR GYPSEOUS EARTH OF GENESEO, N. Y.

The July No. of Silliman's Journal of Science, contains the article which was before published in our last No., (at page 187) describing a bed which the writer considered as simply an impure limestone, or a kind of

hard marl, but which was sold and used as gypsum, and which, in fact, was found to produce similar and as remarkable effects as gypsum. In addition to the piece as sent to us in manuscript, and as published, this has another paragraph, which will be here inserted.

"Mr. Moore's limestone formation is on a hill about five miles north-east of this village. In digging his well, the first three feet was common soil; the next three feet shelly, thin limestone, (this is a common covering of beds of gypsum;) from six feet from the top to twenty feet, which is as far as he has dug, it has the appearance at a short distance, of blue clay; it is brittle, and easily dug up with a pick, and consists of fossils in vast abundance, which would seem to have been interspersed originally with blue earth, which became indurated, and finally limestone. Among the specimens is a large piece of the blue clay limestone. Almost precisely similar formations have been found on several farms. I have never seen any thing similar to it, but am not enough of a geologist to describe it more minutely—one thing is certain, which seems to comprise the main chance, it is equal to the best plaster in its fertilizing qualities."

We had entertained and expressed the hope, that Professor Silliman would be able to dispel the mystery in which this interesting discovery was enveloped. But the strangeness of the facts does not seem to have excited much attention, and there is nothing added by the editor, except two short marginal notes—the first of which merely states of the shells found in the earth, that they are "chiefly *terebratulæ* of great distinctness and beauty"—and the other is in reference to the earth being described as effervescing with acid, and is as follows:—

"Owing to a mixture of carbonate of lime with plaster of Paris, it is not uncommon that the latter effervesces. It is not difficult to decide which prevails. The substance being pulverized and mixed with diluted muriatic or nitric acid, will dissolve entirely, if it is a pure carbonate of lime; if there is a residuum, it may be plaster of Paris, or something else not soluble in the acids. The specimen sent to us by our correspondent was so treated, and indicated about half of carbonate of lime, without plaster of Paris, but with a large clayey residuum.—Ed."

The only light thrown on the subject, by this note, is, that the gentleman to whose observation the public are indebted for this discovery and communication, was right in his opinion, that the lime in this formation was (not only principally, but) entirely, in the state of *carbonate*, and not of *sulphate of lime*, or gypsum, as supposed by others, and as its practical effects would seem to confirm. According to the constituent parts, as reported in the note copied above, the earth is simply a calcareous clay marl—and not even uncommonly rich as a marl. But there is no attempt to account for the wonderful fact, that this substance, used in the very small quantities usual with plaster, (say one bushel to the acre,) should produce as great effects, and so as to leave no doubt on the minds of those ignorant cultivators who judge merely from appearance, that this earth is truly gypsum, and of good quality. Increased importance is given to the subject by this expression of Prof. Silliman's opinion—whether it is considered as establishing the strange (and to us, incredible) fact, that this high fertilizing power is caused simply by carbonate of lime, and of course would be exerted by every calcareous marl similarly applied—or as otherwise, by showing that *no gypsum* is contained, that some other substance must be present, as yet undiscovered, which exercises the remarkable and peculiar powers of gypsum. The subject still needs, and well deserves, the most careful investigation by men of science. To our understanding, the matter is now darker than at first. With all the high opinions entertained for carbonate of lime as a fertilizer, we have not the slightest faith in its producing such effects as these—and according to the analysis of Prof. Silliman, there is not even the smallest ingredient of gypsum present, to which, (before his report, and without having seen a specimen of the earth,) we had attributed the effects produced by the application. We trust that the gentleman who has commenced this investigation will persue it, as he is well able to do, or to have done. Whatever may be the results, they will scarcely fail to lead to important agricultural profit, as well as knowledge.

EXTRACTS FROM PRIVATE CORRESPONDENCE.

Greene Co., Ala., Jan. 7, 1836.

I could say much of the value of your views on soils and calcareous manures, especially in this country, where poor sandy land is so indented by the lime land, and where it is quite common to find a single acre of prairie (always resting on the *rotten* limestone, at a few feet below the surface,) surrounded by those poor lands. These little prairies are frequently found interspersed at intervals of half a mile or a mile apart through these poor tracts of country, destitute of lime. What a field for judicious industry!

I did intend to communicate many facts respecting the black lands, but I find that you are as well acquainted with them as I am, by means of your correspondents who have anticipated all that I could say upon this subject.

Nashville, (Tenn.,) May 20th, 1836.

Though I have not yet perused completely your work, I have learned already so much from it, as to be convinced of its great utility for our agriculturists, and having lately travelled amongst them, I have not neglected to recommend it to those whom I found intelligent. I have particularly been pleased with the improvements of the farms in East Tennessee since they have commenced to use the plaster of Abingdon freely. I do not recollect to have seen the plaster of that part of your State mentioned in your works. It occurs near the salt-works of General Preston and King, and is of a better quality than any imported from Nova-Scotia or France. I was astonished that it was not in such general use in that part of Virginia which borders on Tennessee, particularly in Powell's valley, where the soil seems so well adapted to it.

[In the first published No. of the Farmers' Register, there was given a concise editorial notice of the purity and value of the gypsum of the region of Virginia above named, and other incidental references to it have since been made in several other articles. Still, for a matter so important to the wealth and improvement of Virginia and Tennessee, the subject has been much neg-

lected, and it is not known to many of the people of Virginia, that so rich a mineral treasure exists within the State.]

WHEAT CROP IN THE NORTHERN NECK.

Westmoreland, Va., June 24th, 1836.

In making out your usual report of the state of the crops, it may be useful to know, that in this region the wheat has entirely failed. I have seen no field that will return the seed and defray the expense of harvesting. One of my neighbors, on a small, but very productive farm, on which he has usually made upwards of 1000 bushels, now offers his standing crop, from 87 bushels sowed, for 50 bushels of wheat. Another, who sowed 90 bushels on a very fine field, offers the crop for 40 bushels. My own crop, on land that has been highly improved with clover, sea weed, &c. is not in a much better condition. The severity of the winter and the ravages of the fly, had been very destructive, although where the land was highly improved or freshly manured, the wheat had in a great measure recovered; and my own crop would have been fully an average one, but for the late devastating rains, which have brought on mildew in its most fatal form. In the language of the Edinburgh Review, it has attacked the wheat with the violence of an *apoplectic stroke*—and scarcely one head in a hundred has escaped the paralysis. The weather for the last month has been precisely such as to produce mildew in its most aggravated form, and I am very confident that the disease is not local, but has extended to every part of the Union that has been reached by the late excessive rains. The author of the article on agriculture above quoted, in speaking of the failure of the crop in England in 1808, says if he had been in the West Indies, and had been informed that it had rained at a critical period of the season for nearly four weeks, he could have predicted with positive certainty the destruction of the wheat by mildew. The rain commenced here more than 4 weeks ago, and with the exception of a very few fair days, we have had almost constant rain since. The wind is now at N. E. accompanied with a heavy mist. Last night the rain poured down in torrents. The corn crop is of course in a very backward state, and upon wet lands, the prospect for a crop is gloomy indeed.

These few lines are written just before the close of the mail—and are not intended for publication in their present form, though the information contained is much at your service.

[The foregoing letter was received too late for our last No., and is now inserted, though "out of date," because its details and its reasoning serve to throw light on the general and disastrous circumstances of the present wheat crop. Though contrary to the writer's intention, we have preferred giving his facts in his own words: and though not at liberty to give the signature to a private letter, there could be none that would carry with it more respect and authority than that of our much esteemed correspondent.]

THE SEASON, AND WHEAT CROP.

We might fill pages with statements extracted from other prints, serving to prove the general failure of the wheat crop, in the greater part of the Atlantic States, and confirming, to the fullest extent, the view and anticipations presented at the close of our last No. as to the crops of Virginia. But it is unnecessary thus to occupy space, where there remains so little difference of opinion. There is now no doubt that the statement of general deficiencies then presented, before the wheat was reaped, was even more favorable than the crops of Virginia will realize. The gross product of the entire State, will not exceed (if it even equals) the third of an average crop, in quantity—and of that the quality is so inferior, that a new and important difficulty on very many farms, and in many entire neighborhoods, will be to obtain enough of sufficiently good seed for the next crop, It may be computed that one ninth part, *at least*, of an average crop would be required for seed—which will be equal to one third of the crop of the present year: and as the best grain must be saved for that purpose, the balance for the farmers' home consumption, and for market will be only two thirds of the present crop, or two ninths of an average crop—and that of the basest quality of what this crop offers.

The wetness of the season has been favorable only to oats on high land—but destructive even to that crop, which requires so much moisture, on low grounds, usually the most favorable to its growth. Neither corn, tobacco or cotton in Virginia, can be conceived in as good as an average state—and every thing (except our land, and the natural and neglected resources for its improvement,) is high priced, whilst the amount of agricultural products furnish most scantily the means for purchasing.

COMMERCIAL REPORT.

The month of July is usually the commencement of the dull season, which continues until October. The tobacco trade is, in Virginia, the only active one at present, and this does not exhibit its usual animation in the extent of competition and wide range of prices. The dull state of European markets, which has prevailed during the year, somewhat depresses the spirit of speculation; but the market has been steady at prices which amply remunerate the planter. The lowest sort of *refused* and lugs continues brisk at 5½ to 6½, and *passed* commands 7½ to 10 for export, while fancy qualities go considerably higher, but do not admit of quotation. The quantity now offering for inspection in Richmond is very large, and until the close of next month, it will be difficult to draw a parallel between the crops of the past and preceding years. At present there appears a considerable deficiency in Virginia, compared with the inspections of last year, and an immense increase in Kentucky is already ascertained.

The reports from various parts of the United States, generally agree in representing the wheat crop as having sustained more or less injury—the extent of which appears to be greatest in Pennsylvania, Maryland, Virginia and North Carolina—approaching in some parts of the country to almost a total failure. In New York and the western states, the injury is said to be less; but until the harvest is gathered, it will be difficult to judge cor-

rectly, if appearances are as deceptive there as here, where in many places the straw was luxuriant but the head grainless. The harvest in Virginia is certainly the least productive that can be remembered. No new wheat has yet been brought to market, nor can any price be quoted. So much of it will be lighter than the standard of merchantable wheat, that prices will probably appear low where the quality is not known. Flour has advanced to $7\frac{1}{4}$ to $7\frac{1}{2}$, and would be higher but for the risk of keeping it through the summer. The mills near tide water in Virginia, must obtain supplies from abroad if they be kept long at work.

The cotton crop is nearly all at market. A few hundred bales per week arrive at New Orleans, and scarcely any at other ports. If the statements published be correct, the crop of last year will prove to be about 1,330,000 bales, or 75,000 more than the previous one. There is, however, an annually increased quantity taken into the interior for consumption, which cannot well be ascertained, and which would add to the quantity reported as manufactured in the United States. Prices in England declined in May and June. In this country they have advanced, particularly for fine qualities. Sales in Petersburg 14 to 17 cts.—In New Orleans 10 to 20 cts.

Money is not plenty, and stocks are low in Wall Street, the great theatre of operations, where the brokers play their game. Exchange on England keeps down to $7\frac{1}{2}$ per cent. premium.

The money market is no doubt somewhat affected by the recent treasury circular requiring payments for public lands to be made in gold and silver. Whether any and what effects will be produced on the currency, and general interests of the country, by this new experiment, remains to be seen: something will no doubt depend on the extent of the evasions which may be contrived.

July 23rd. X.

ACCOUNTS AND COLLECTIONS.

When the second No. of our current (4th) volume was issued, bills were sent to all subscribers who were indebted for one or more previous volumes—and not to any one (unless on account of some mistake existing,) who owed only for the current volume. At a later time, all the same bills, which still remained due from subscribers in Virginia, have been placed in the hands of collecting agents, who will not be able to present them all, until nearly another year has passed. Experience had proved the propriety of making no exceptions to the general rules adopted in those respects—and therefore, bills have been sent by mail, and may be afterwards presented by a collector, to many individuals who certainly do not require such applications, and whose payments, heretofore usually most prompt, have been now delayed, merely from inattention. Our excuse to all such subscribers will be presented in the manifest necessity of pursuing the same general rule to all persons who are more than a year in arrear, without regard to the difference of causes.

The sending these bills has also served to make known, and to lead to our ready correction of some errors and over-charges which from several causes had existed in our accounts. Though we have not been able to avoid making mistakes and omissions in this respect, yet the plan of printing receipts monthly, affords to every subscriber a ready and sure mode of detecting and establishing errors: and whether made known by that or any other means, we will at all times thankfully receive notices of errors, and will readily correct them.

To subscribers at a distance from the limits of Virginia, it has not yet been in our power to make personal applications for payments of arrears: and no considerable inconvenience has thence arisen, inasmuch as our most remote subscribers, in the general, are the most punctual payers on the list. Against the very few among them who have not pursued this course, we have almost no remedy. Theirs are simply debts of honor. It is not probable that any other obligation can be brought to bear on them.

These remarks are designed more to explain our usage, and to prevent giving offence by its application in particular cases, than to quicken payments. Though the subscriptions for each volume, according to the published conditions, are due in advance, we are quite content if they are received at any time during the publication of that entire volume; and no bill is ever designed to be sent to a subscriber who is not more than a volume in arrear. But when bills must be sent, they are made to include all that is actually due, and of course embrace the current volume.

To the great majority of our subscribers we owe thanks for a remarkable and unusual degree of punctuality and promptness in their payments, in addition to all other evidences of their favor and kind support. It is believed that no other journal in the United States is better paid for, according to the number of subscribers, than the Farmers' Register. Many readers, not acquainted with such details, will be surprised to hear that a loss of at least one fourth of all subscriptions, is usual, and as little as most publishers can expect to meet with: and our brother publishers would be as much surprised to know how much better has been the character of our list. More than 1600 subscribers have either taken the first volume, or commenced in part of it: and of that number there remain less than 40 names of those who have not paid. Yet the work was sent to all applicants, without distinction as to their locality, and in far the greater number of cases, without payment being made at the time of subscribing for the work.

REMARKS ON THE PROPAGATION OF HYBRID ANIMALS.

To the Editor of the Farmers' Register.

In the first volume of your work, page 193, is an article on the influence of parentage on offspring in breeding animals, written by myself. While writing that article, I was much tempted to venture considerably farther into the regions of speculation. In concluding to do so now, I plead the apology contained in the first sentence of that communication: "The prejudice against speculation may be carried too far, in matters which have not attained to perfection." It was maintained, that, in order to form a new race of animals, the individuals composing it, must, from each of their parents, inherit the blood of two existing races. Many new races have, most probably, been thus

formed, without regard to the principle on which success depends. A ram, for instance, of good breed, may have been introduced to a flock of a different one, and after several generations, allowing opportunity for both sexes to possess some of his blood, it may have been found, that distinctively a new race has been produced, essentially differing, both from the first progenitors, and the first direct or mongrel cross. If the principle be true, its benefits might be obtained, in most cases, without the liability of incurring the evils of breeding *in and in*. And the proper commixture of the two races experimented on, could be better settled by skill in the breeder, than when left to accident.

But my object at this time is to make some remarks on the subject of hybrids. It appears to have been ordained, that, as a general rule, these should not breed. The wisdom of this law of nature—as it prevents the extinction of original species and the filling the world with monsters—will be readily perceived. I can, however, see nothing outrageous in the supposition, that many new species may have been formed since the creation, and that many more may be formed. Economy in the use of means, shows so conspicuously in all the works of nature, that it requires no stretch of imagination to suppose, that the many species of plants and animals would hardly have been directly formed, when, possibly, the whole of them might be produced from two species of each genus. We find that hybrid animals discover no defect of sexual desires, and I do not think it violent to suppose, that these might lead to the production of offspring, were it not for some modification in the structure of their sexual organs, which might require peculiar circumstances to effect such an object. These circumstances I have supposed simply to be, that such animals should come into company with others similarly descended, but with parents of opposite sexes. I think it highly probable that procreation would ensue from an association of the female mule with the male hinny, and *vice versa*. We have indubitable evidence that hybrids do sometimes breed, and that Mr. Kilby of Nansemond has a mare mule which has produced two colts. (See vol. III. Farmers' Register, page 440.) Now, suppose this gentleman were to put the mule to an ass, and it should produce a colt differing in sex from the one now living, there is much reason to believe that a continuation of the mule as a distinct and independent species, might be kept up from the two colts thus produced. If Mr. Kilby should think proper to raise more colts from his mule, I think it probable that he would find them more hardy and serviceable when produced from the ass, than from the horse; the hinny—the progeny of the horse and the she-ass—being said to be a very delicate and useless animal.

Having failed in my attempts for many years, from a variety of accidents, to test the principle on which the foregoing speculation is founded, by using the different species of ducks, and finding that Mr. Kilby has it in his power to make a fair experiment, I have determined to submit the *notion* to you, to him, and, if you think proper, to the public, and am, sir,

Most respectfully,

Yours, &c.

A. B. C.

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